FOUNDRY TRADE JOURNAL

Established 1902

Vol. 92 Thursday, April 10, 1952 No. 1858

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PUBLISHED WEEKLY : Single Copy, 9d. By Post 11d. Annual Subscription, Home 40s., Abroad 45s. (Prepaid).

49, Wellington Street, London, W.C.2. 'Phone : Temple Bar 3951 (Private Branch Exchange) Grams : "Zacatecas, Rand, London"

A Lesson neither Learnt nor Taught

Obviously, castings cannot be made without patterns, and good castings cannot be produced without correspondingly good patterns. For quantity production, nothing but the best of patterns will suffice and, for both production and productivity, the best equipment is a prerequisite. These facts are so well known in the foundry industry that it would seem scarcely worthwhile repeating them, yet proof is available every day in the jobbing shop that such knowledge does not extend beyond the confines of the foundry. A cheap pattern is made for a one-off job, which thereafter grows into a dozen, twenty, or even a total of fifty. Again, there is an assumption by the engineers' buyer that a set of patterns accepted by one foundry is thereby quite suitable for all others, quite disregarding changed manufacturing conditions. An efficient foundry salesman is not the man who believes it is good business, after a call on a customer, to pack a set of patterns in the back of his car.

Haggling and compromise over patterns is due, fundamentally, to the fact that the customer does not fully appreciate the facts set out above, and it is not unreasonable to ask "Why should he?" Quite candidly, beyond vague generalisings about co-operation between designer and foundry interests, the customers have little knowledge that they will benefit materially by giving the founders the best possible tools so that they can deliver, as a result, better and cheaper castings in a shorter time. If the provision of better patterns could be widespread, the impact on the jobbing foundry industry would be such that a much-improved service could be given to the customer.

The task of making buyers appreciate the economics of the provision of the best-possible pattern for the job is not easy. It can be hammered home in every discussion with buyers. In all correspondence on the subject of pattern equipment, the slogan "Good castings demand good patterns" could be introduced. More difficult, of course, is the convincing of the buyer that the expensive equipment he sanctioned for one foundry may not be acceptable to a second; thus another lesson to be taught is that, under to-day's manufacturing set-up, patterns are not so readily interchangeable as they used to be. On these questions we ask all founders, either individually or collectively, to initiate a campaign for ensuring that the buyers really appreciate the truth of the elementary statement, "for the making of good castings, good patterns are essential."

E

Fourth Annual Foundry Foremen's Training Course

This annual event seems to be increasing in popularity and this year was attended by well over 200 participants. It was held last week from Thursday night to Saturday morning at Ashorne Hill, Leamington Spa. There is no doubt that the foundry foremen do appreciate this event as a welcome break in the daily routine. They are men of very decided views and do not hesitate in expressing them. Naturally, in a complex industry such as the foundry, it is the human aspect and not technology which evokes the most discussion. That is because it is common ground, whereas most technological problems are sectional. It is curious to learn how the recruitment of apprentices varies from shop to shop. There is either a plethora or a complete dearth. It seems the art of salesmanship specially directed to youth is missing.

The programme was both attractive and well balanced. It opened, after an evening devoted to the showing of technical films, by a well-received address of welcome from the Institute's president, Mr. Colin Gresty. Then followed an address by Mr. A. W. Wood, assistant works manager, Coneygre Foundry, Limited, on "Responsibility of the Foreman to the Man." *Inter alia,* the advantages of a unit system of manufacturing were described and obviously much appreciated, but it was the "human relations" which came in for the most part of the discussion.

Two most useful papers were given on "Modern Ideas in Coremaking" by two young graduates from Yorkshire. One was Mr. C. S. Johnson, chief metallurgist, West Yorkshire Foundries, Limited, and the other Mr. D. T. Kershaw, chief chemist, Modern Foundries, Limited. The use of new resin bonds was explained in a thoroughly practical manner, and some information was given on the "C" process. In the afternoon there was a joint discussion led by Mr. George C. Pearce and Mr. B. Levy, director of B. Levy & Company (Patterns), Limited, on "Does the Patternshop give the Foundry What it Wants?" This question was quickly reversed in discussion to one of "Does the foundry know what sort of patterns it requires?" Again, the question arose as to the average foundry foreman's inability to read drawings. However, he is not too bad, providing plenty of time is available for their study. The three discussion groups were well patronized and beyond a couple playing billiards and a further pair yarning in the lounge, all were on duty. Saturday morning was devoted to hearing Mr. G. W. Nicholls, manager and metallurgist, Modern Ironfoundries, Limited, talk on "Quality Control and the Study of Moulding Processes to Eliminate Casting Defects." No more popular subject could have been chosen.

The training course was well supported by the officers of the Institute, Dr. Dadswell and Mr. E. Longden, the vice-presidents, and the two permanent officials, Mr. T. Makemson, M.B.E., and Mr. G. Lambert. The following past-presidents were also present as stewards:—Mr. V. C. Faulkner, Mr. J. W. Gardom, Mr. N. P. Newman, J.P., Mr. J. J. Sheehan, and Mr. P. H. Wilson, J.P. The organization as usual was a model of perfection.

THE CHANCELLOR OF THE EXCHEQUER, giving a list of subsidies paid to private industries and agriculture, stated that the subsidy to the iron and steel industry was £7,900,000 in 1951-52 and £4,500,000 in 1952-53. The total amount voted in 1951-52 in respect of iron and steel for both subsidy and trading loss was £8,840,000. There would be no trading loss in 1952-53.

Institute's Delegation Leaves for America

A number of members of the Institute of British Foundrymen leave Liverpool to-day in the Britannic to take part in the International Foundry Congress in Atlantic City, U.S.A., and in the pre- and post-congress tours. Currency restrictions have naturally limited the number who can take part, but the restriction is on a reduced scale, because of the assistance offered by the American Government which has organized an international Technical Assistance Project from Europe. A number of those on the Britannic are members of this team. The Continental party left Cherbourg yesterday, and all the members of the Technical Assistance team will join together in New York.

Representative foundries will be visited in Cleveland, Chicago, Milwaukee, Cincinnati and probably in Philadelphia. The Congress proper will be in Atlantic City from May 1 to 7 inclusive, and at the same time there will be an exhibition of foundry equipment, which is probably the biggest specialized exhibition of its kind ever held. Arrangements are being made for reports of the Congress and the Congress tours to appear in the JOURNAL.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

50 YEARS OF MALLEABLE PRACTICE IN ENGLAND

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I notice with embarrassment that the article I wrote for the Golden Jubilee Number of the FOUNDRY TRADE JOURNAL under the title of "50 years of Malleable Practice in England" has, without my knowledge or consent, been altered to "America Outstripped in 50 years of Malleable Iron."

The studies made of American practice by productivity teams, and visits by myself and my colleagues have shown clearly that whilst British methods have made considerable advancement, our American friends still lead the field in productivity, although we ourselves over here, if given a chance of carrying out modernization schemes unfettered, could produce results which could compare favourably with American practice. I feel that the choice of the word "outstripped" is most unfortunate.—Yours, etc.,

F. D. LEY,
Managing Director.
Ley's Malleable Castings Company, Limited,
Derby.

[We regret having misinterpreted the trend of the article, and apologize to all who have been inconvenienced.—EDITOR.]

Forty Years Ago

Our issue for April, 1912, opens with an illustrated description of the Héroult electric furnace installation at Lake & Elliot, of Braintree. In those days, the process yielded steel with combined sulphur and phosphorus of less than 0.03 per cent. There were no fewer than four articles dealing with the electric furnace which throws the issue out of balance. Amongst new companies noted was David Brown & Sons, Huddersfield. J. W. Jackman, Limited, removed to their present address. Mr. R. Mason, a founder of the Institute of British Foundrymen, left this country for Australia.

Dust Problems in Foundries

I.B.F. London Branch Discussion

Following the opening of the meeting, the national president of the Institute, Mr. Colin Gresty, was welcomed, along with Mr. W. B. Lawrie, M.Sc., F.R.M.S., A.I.M., H.M. Inspector of Factories (Engineering and Chemical Branch), who later presented a Paper and film dealing with observation and control of dust in foundry dressing operations.

MR. GRESTY, after thanking members for their welcome, outlined the background against which the work of Mr. Lawrie could be seen to advantage. The "Dust in Steel Foundries" committee of the Factories Department, he said, was the first to deal with the dust problem in the industry; that committee was still in existence and had just produced its second main report. A year or two after the committee had begun, the Joint Advisory Committee on Conditions in Iron Foundries, which had become known as the "Garrett" committee, was formed. When it had completed its work and had reported, it was dissolved; but it was followed by the Joint Standing Committee, a smaller body, which was visualised by the "Garrett" committee as being necessary to follow up unfinished work and generally to keep under review the progress made with regard to the various projects enumerated in the original report.

Problems Enumerated

Subjects still needing attention were methods of drying moulds and ladles; the question of corebinders and the fumes arising from them; all sorts of problems about knock-outs and general ventilation. Further, the committee had visualised the necessity of determining the amount of dust in the atmosphere, and of formulating a standard by which foundries could be judged. It was that subject in particular with which Mr. Lawrie's Paper and film would deal. Another matter which was left over for investigation was how far vacuum cleaning could be adopted in foundries to supersede dry brushing and the use of compressed air when cleaning moulds prior to closing.

An item which must be considered along with ventilation was that of space heating. If a foundry were over-ventilated, or if a tremendous amount of air were taken out of it by exhaust ventilators, obviously it was a very big job to maintain the desired temperature. Perhaps Mr. Lawrie would enlarge on that aspect. Since the Report had been published, a great deal of progress had been made with the various recommendations it contained, that on ventilation was being channelled in two main directions.

* Report of a meeting of the London branch of the Institute of British Foundrymen, Mr. L. G. Beresford presiding.

Research Association's Work

Two main committees of the Factory Department were dealing with the work—the Dust in Steel Foundries Committee and the Joint Standing Committee on Conditions in Iron Foundries. The first of the channels along which work was being directed was through the British Steel Founders' Association, Research and Development Division. That was a continuation of the work done earlier by the British Iron and Steel Research Association, Steel Castings Division. Discussing the items with which that Division was dealing, apart from certain matters which were common to all workers, Mr. Gresty mentioned first non-siliceous moulding materials. This work was proceeding by trying to do without siliceous materials and to find substitutes for moulding sands; also, with the prevention of burn-on of sand to metal, and there were indications that progress was being made. Work was being done with flux-injected burners, by which it was hoped eventually to do away with the use of pneumatic chisels. Again, new types of masks to be worn by workers in dusty atmospheres were being tried, and some fundamental research was being done on the particular properties of steel-foundry dusts. It would be appreciated that the problems in the steel foundries, so far as silicosis was concerned, were considerably greater than in iron foundries; but the ironfounders could not afford to be complacent.

The British Cast Iron Research Association was studying problems connected with carbon monoxide and sulphur dioxide which were liable to be given off by certain items of foundry plant and various foundry processes. Here, Mr. Gresty mentioned, for example, the work on mould-driers and the amount of carbon monoxide arising from them under different conditions; also, for instance, much carbon monoxide could be detected around the base of a cupola. Additionally, a rather big subject of fumes from corebinders was being tackled. Chemists would realize that that was chemically a very difficult job, because of having to deal with the products of destructive distillation of a very mixed number of organic compounds; this was essentially a long-term task. Then, there was much interest in possible substitutes for present day corebinders, such as the use of plastics. The work in that connection had been helped quite considerably by the Institute of British Foundrymen.

Dust Control Investigations

Apart from special items, there were others under investigation by both research associations. One was ventilation at knock-outs; it was a very thorny problem as to whether the draught should be

upward, downward or sideways. Similarly, dust from grinders was being dealt with. Part of Mr. Lawrie's film showed clearly that the exhaust of the stand grinder, though made in accordance with Factory Department regulations, did not work properly and that matter was being investigated. "Wetting" agents—chemicals added to water to reduce the surface-tension so that the water absorbed dust more rapidly—were being tried, not, he thought, a very hopeful line of attack. The Associations were also dealing with dust sampling, counting and analysis and were surveying as many foundries as possible.

Co-operative Attitudes

In addition to the work of the Institute of British Foundrymen on synthetic-resin core-binders, through the medium of the Joint Standing Committee, there was very able co-operation from the Foundry Equipment and Supplies Association. Again, co-operation had been established between the British Cast Iron Research Association and the Building Research Association, with the object of ascertaining the best materials for foundry buildings.

Concluding, Mr. Gresty said that of all the various committees and associations which were dealing with the numerous problems, Mr. Lawrie was the one connecting link. He was a man of ideas with technical knowledge and very considerable experimental skill; in addition, and perhaps most important of all, he was a most enthusiastic worker.

MR. LAWRIE, after thanking Mr. Gresty for his complimentary introduction said that, really, not very much was known about the work. It was still in the early stages and all were anxious to obtain assistance and co-operation of any or all of the members of the London branch and the rest of the Institute.

In endeavouring to improve conditions in British foundries we were of necessity drawing attention to some failings. That was good insofar as it led to further endeavour, but was entirely bad as it gave a distorted picture of the industry. He would be talking about dust in foundries and the meeting would discuss ways and means of dealing with it; but he had no intention, generally, to denigrate the ancient craft. The salient feature of the art and practice of moulding was the skill it demanded from those who served the industry. One of the criticisms of modern industry was that it turned men into machine-minders, and if one were to believe psychologists and psychiatrists it destroyed character, and soul, by the sheer weight of boredom that crushed initiative and stifled ability. If that was true generally, then at least the foundry was one industry which still remained a craft and which still offered all the incentive of the craftsman's way of life.

He used this approach for two reasons; the first was that he would be in danger of losing a sense of proportion if he concentrated on bad conditions and forgot that founders made good castings. The second reason was that he believed conditions would best be improved by the persistent and determined application of the very craftsmanship of which he spoke, because he was quite convinced that improvements of a lasting character and real value would spring from the industry itself, and not be imposed by external authority, however benevolent. They would emanate from the skill of the foundryman as he put into practice his own personal ideals for his own craft. In the past we had in this country made the finest castings in the world and he believed that, if founders truly concentrated on the task, they could make those castings in the world's finest foundries.

All the problems of this diverse industry, however, could not be solved by central committees, however willing and however skilful they might be. Secondly, however much one tried to avoid it, the fact remained that founders were limited in their aspirations by what they could afford, they had to sell castings in the markets of the world—this was a fact which must be met by a greater ingenuity and a wider skill in the development of good conditions.

Mr. Lawrie then acknowledged indebtedness to colleagues in this work, including those from the British Steel Founders' Association, and Mr. Gresty himself.

General Problems

Turning to the subject under discussion, he said there was little doubt that immediate improvement in dressing conditions in foundries would result from the suppression of dust concentrations in the shop atmosphere. This work was only part of the work in hand, however, and before dealing with it in greater detail he briefly surveyed a much wider field, so that, in the discussion which was to follow, members could raise particular points in which they were specially interested.

It was a great mistake to think that "dust suppression" and "dust control" were synonymous. Dust suppression included all the methods by which one got rid of unwanted dust, which methods fell very largely into two groups, the first of which was "dust elimination." The second group was "dust control" and local exhaust ventilation was only one of the control methods. This proviso was made so as to put into proper perspective the work illustrated in the film which was shown. Local exhaust ventilation was not the only method, nor was it necessarily the best of the methods which were available. Any method which *eliminated* dust was by far the best, for the real way to deal with a dust cloud was to stop making it. It was not the easiest way, it made great demands on the scientific and technical ability of the staff in charge of a process, it called for a wide outlook, great flexibility of mind and a real willingness to try something fresh, but, if it could be done, it warranted almost any endeavour in the development stage. It was the only method which was an end in itself.

The Millenium

Foundry practice should be reviewed very closely with two objects in mind—the first was to reduce the dust in the foundry itself and the second to

reduce the dust in the dressing shop. To reduce dust in, or to eliminate dust from the dressing-shop, one could only do this by making a better casting and in the final theoretical case a casting which required no dressing whatever, apart from the removal of risers and runners. The way to reduce dust in the dressing shop was, in the long run, to scrap all dressing processes which were occasioned solely by casting defects. To this end, it should be borne in mind that the ultimate object of every process in the moulding shop was to reduce the amount of effort which would be needed to prepare the casting in the dressing-shop.

Sand practice had a good deal to do with the problem; for instance, as to sand costs, he wondered how many founders estimated sand cost as the cost of the sand at the works' gate, and how many used an unsuitable sand from a local dump simply because it was thought cheaper. Had founders stopped to think how much really was added to the cost of sand as the result of a bad finish on the casting and the amount of dressing which was required? Sand practice needed very careful consideration from the dust hazard viewpoint. Steelfounders were often troubled with sand burn-on, a condition which did not occur to any extent in the iron foundry. Quite a considerable amount of fundamental work sponsored by the British Steel Founders' Association was going on in universities in an attempt to find out why the sand burned on; if possible to prevent it and by that eliminate a prolific source of dangerous dust.

Partings and Mould Dressings

The first report of the " Dust in Steel Foundries " committee laid stress on the use of non-siliceous substitutes for silica-flour. In the second report the field of investigation had been widened, because it had been recognised that if the non-siliceous paint involved an inferior " strip " there might be more, and not less dust in the dressing-shop. Silica-flour was not permitted for use as parting powder; but for paints and fillers the stress had been altered slightly, because after some of the major steelfounders in this country had worked on substitute materials—silimanite, zircon, and so on—for facing materials, the results were quite indeterminate. Some foundrymen could produce equally good, or better castings with the substitutes, but others could not produce castings as good as with silica-flour. As a result, some steel foundries were now using substitutes and some had gone back to silica-flour.

Flux Burners

Another method of dust reduction was to eliminate dust-producing processes. For example, the pneumatic chisel produced free-silica dust in the steelfoundry dressing-shop, and so steelfounders were experimenting with a flux-injected oxygen burner. Into the flame of an oxy-acetylene torch was injected a suitable flux so that the metal-penetrated sand would slag at the flame temperature and give a substance known as fayalite, 2 FeO. SiO_2. As a result, the free-silica fraction of the dust was eliminated along with a reduction in the risk of silicosis. A description of this work was included in the second report of the " Dust in Steel Foundries " committee. On the ironfoundry side, Mr. Lawrie suggested greater attention to gating practice, sand practice, casting temperatures, ramming density, moisture content in green-sand moulds, and the temperature of the sand—in mechanized shops, he thought the latter would be controlled by the sand/metal ratio in the box. All these things had a bearing finally on the dust-concentration present in the foundry atmosphere and in the dressing-shop.

Film Show

Mr. Lawrie then went on to describe in some detail the " Dust in Steel Foundries " film which was to be shown subsequently, and gave a brief account of the work which led to the making of the film and the development of the K. & L. fettling bench. Descriptions of these have already appeared in the JOURNAL* and will therefore not figure in this account. As a result of all this work, Mr. Lawrie concluded, there was now a method by which one could observe the movement of air-borne dust in the respirable size range. Fundamental information was being obtained in this manner, and it had opened-up the possibility of empirical aerodynamic observations on new foundry equipment. Dust from a pneumatic chisel was under control, for the first time, he thought, in the case of light castings, and the makers were trying to increase the size of the fettling bench to take heavier work. It had been shown in one case that a high-velocity air-curtain using a small volume of air might behave better than a large volume with a low velocity, and this was a principle which might be of much wider application.

The film, which presented a new method of observing the movement of dust of respirable size range in works conditions and gave examples of the application of the method to certain machines fitted with local exhaust ventilation, was then shown.

DISCUSSION

THE BRANCH PRESIDENT, after commenting on the great interest of the remarks by Mr. Gresty and Mr. Lawrie, and of the film, said Mr. Lawrie issued a challenge to the London branch that its name should go down in history as a body which had contributed towards eliminating, or at least alleviating the dust hazard in foundries and he expected the discussion to answer that challenge.

MR. JOHN BRIGG asked if Mr. Lawrie had had personal experience of the use of the flux-cutting method. His own experience in the cutting of stainless steel—as distinct from iron or steel castings—was that the dust engendered by the new method was phenomenal; so far he had not found any equipment which would cope with it.

MR. LAWRIE replied that the dust which came off a steel casting when dressed by means of a pneumatic chisel contained a fraction of small-size-range free silica (SiO_2), which caused silicosis. The object of using the flux-cutting burner in a

* " Observation and Control of Dust in Foundry Dressing Operations," FOUNDRY TRADE JOURNAL, July 26, August 2 and 16, 1951.

steel foundry was to eliminate that fraction of the dust, with the specific object of eliminating the disease. It might produce equally dusty looking conditions, and indeed probably did; but if by its use the source of disease could be removed, something worthwhile would have been accomplished. The inconvenience of the dust still had to be dealt with by other means. He mentioned the use of the pneumatic chisel on a 3-ton double helical pinion steel casting, where the sand between the teeth occupied the whole of the space to the level of the circle of the teeth themselves. The dressing of that job with the pneumatic chisel had occupied 50 hrs., but it was done in 15 hrs. by means of the flux-injected burner. So that, when using the latter instrument, the concentration of dust lasted for a much shorter time than when using the pneumatic chisel.

Applying an Air Curtain to Grinders

MR. BIRKIN, commenting on the success of the curtain of air in controlling the dust stream, asked whether anything had been done to apply a counterflow to a grinding wheel—a fairly strong blast of air directed on to the wheel in contra-direction to its rotation.

MR. LAWRIE replied that it had not yet been done, but was in hand. The Foundry Trades Equipment and Supplies' Association was working on the problem, along with the British Steel Founders' Association, the British Cast Iron Research Association and many ventilating engineers. The film which he had exhibited had been mainly exhibited since the annual meeting of the Institute of British Foundrymen in June, 1951, so that there had not yet been time to do much, although three or four different types of exhaust hoods had been manufactured, and other ideas were in fairly advanced stages on the drawing board. The possibility of "stripping" dust from a wheel by means of an air jet had been considered, though it might involve quite erratic vortices in the hood itself and such problems would have to be met as they arose. It was hoped to make a Perspex hood or to provide Perspex windows in a hood, so that it would be possible to photograph through them in order to find out what occurred.

MR. R. BLANDY asked for information on the incidence of silicosis in non-ferrous foundries, arising from the use of parting powders.

MR. LAWRIE could not give it off-hand. The latest information on silicosis in this country, he said, was contained in a report by McLaughlin some months ago. He was certain, however, that the information did not cover any purely non-ferrous foundries, although there were some which dealt with brass and the like and which were also ferrous foundries. Those engaged in the work had not done very much in the non-ferrous foundries as such, because they were trying to narrow the field in the hope that in the narrower field they could deal more deeply with problems arising. Nevertheless, it was hoped that the results would also be applicable to non-ferrous foundries. Siliceous parting powders should not be used these days; if they were, silicosis would almost certainly result.

Individual Respirators

MR. B. LEVY said that in the patternshop it was necessary to do quite a lot of grinding and trimming of cast iron, which resulted in throwing-up fine dust, causing annoyance to the operators, who were trying to work to close limits. At his works, to reduce that annoyance, each operator wore a gauze filter. It consisted of two pieces of gauze with a layer of cotton-wool between, held by a light sheet-aluminium retaining plate. The operators liked such filters and the wearing of them was obviously comfortable, because operators used them for a number of hours at a time when working small high-speed grinders.

MR. LAWRIE said the British Steel Founders' Association had developed another filter mask during the last two years; this was now on sale and was the most efficient mask he had seen. It had been well tested and, through the trade unions, it had been distributed to foundries here and there. Dressers who had used it agreed it was the most comfortable mask they had come across. In the second report of the "Dust in Steel Foundries" committee published by H.M. Stationery Office, the last Appendix gave a description of another type of mask which was being developed. It was not a filter, but was a cover for eyes and nose, fresh air being blown into it at slight pressure. Such a device would restrict the range of movement of the man wearing it; but, after all, when using the pneumatic chisel the man was already restricted by the length of the hosepipe conveying the compressed-air.

MR. LEVY asked if he considered that masks as a whole were not of much use.

MR. LAWRIE would not go quite so far as that. Quite a lot of time had been devoted, he said, to the development of a good mask; but he would not rate the mask any higher than as a first-aid or interim measure, pending the development of more positive means of dust control. Masks were unpleasant and uncomfortable to wear. However, a good mask served a very useful purpose, and should be worn where necessary.

MR. W. WILSON asked how in foundries one could enforce the use of masks or, for that matter, safety boots and other means of protection. In his experience it was impossible to do this.

MR. LAWRIE replied that this was always a difficulty, although the provision and use of protective equipment was a legal obligation in certain cases. He added that this was a matter which could be referred to H.M. District Inspector of Factories, who would probably be able to give assistance.

Jobbing Founders' Problems

MR. D. GRAHAM BISSET commented that the amounts of dust present in foundries, as shown by the film, were staggering, and the problem was a

very serious one, particularly for the many small jobbing foundries. The film had depicted what seemed to be the type of dust-extraction which could be tackled by all foundries, but, of course, guidance must be given by the people who were doing the essential development work. Very much of the dust was due to fettling and it was interesting to hear of the efforts to reduce its extent, but he wondered whether, if there were no fettling shop, there would be a foundry at all. Mr. Bisset asked for more information as to the places in the foundry itself which gave rise to most dust and fume, the steps which might be taken in jobbing foundries, and on the problem of general ventilation.

MR. LAWRIE, commenting first on the suggestion that when there was no fettling shop to reclaim bad castings, there would not be a foundry, said he could not agree; he hoped that somebody some day would produce castings which did not need so much fettling as many he had seen. In that connection, however, he pointed out to the ironfounders present that the castings shown in the film were not normal steel castings; they were bad castings which were specially selected to give rise to heavy clouds of dust, in order to test the dust-control methods under the worst possible conditions.

The degree of the dust danger varied in accordance with the processes in the foundry from which dusts arose. The most dangerous tool in the foundry was the pneumatic chisel when used on steel castings. There were other parts of the foundry where dust was still objectionable and from which it should be removed. Some of the clouds of dust seen in the film might not be dangerous, in that they would not give rise to a specific disease, but they were unpleasant.

Information Requested

A good deal of work was being done, though it was time-consuming, and it would be published, of course, just as quickly as it could be finished. In the meantime, those engaged in the research would be grateful if foundrymen would submit their ideas on the subject to the Institute, to the secretaries of the branches, to Mr. Gresty or to himself, in order that those ideas should be considered by the committees. The difficulties of the problem, of course, varied with the circumstances in each case. A mechanized foundry turning out a very large tonnage in a very small space, he considered, provided the conditions which were most difficult for the ventilating engineer to tackle. In jobbing foundries, the conditions varied very widely indeed. Some gave very dusty atmospheres, whilst others were relatively clean. In consequence, the committees were trying to deal with the worst problems first; when these were settled, it might be possible to deal with the country foundries which were only casting for perhaps a few hours a week or for half an hour on Friday afternoons.

One prolific source of atmospheric pollution in foundries was the open fire, of which he could find nothing good to say, and he urged that its use should be abandoned. Possibly it was thought that, at the moment and for certain jobs, founders could not do without it; but the sooner they could devise means with which to replace it, the better.

General Ventilation

On the question of general ventilation, Mr. Lawrie said that much more information was needed, and it was hoped to do some work in that direction. As indicated by Mr. Gresty, the Building Research Station had been called in. There were foundries in which fumes levelled-out at a height some feet below the fans, and the fans never extracted them. Knowledge of the best height for a foundry was required from the point of view of providing the best ventilation system. Obviously, crane clearances and so on, would be a limiting factor, but it was hoped shortly to be able to plot air movements, and convection currents, which resulted from the various dust and fume sources in the foundry. That was the sort of way in which to attack the problem at this stage in the jobbing foundry. Then, there was the problem of what to do with the filthy dust-cloud which was raised when a heavy casting was lifted out of the moulding pit. Work was being done on the use of wetting agents in order to find out whether the dust could be controlled better by the use of "wet water"; but after six or twelve months of work the results were so indefinite that he just did not know the answer. Another example was the process known as "easing"; this, too, gave heavy dust clouds. The best method of suppression would be to stop "easing" altogether, and this might be possible in more cases than was sometimes envisaged, if highly-skilled foundrymen would give serious and persistent consideration to improved moulding methods.

Electrostatic Precipitation

MR. RHODES asked whether anything had been done concerning ionization, the passing of electric currents through the dust in order to direct it to screens. He believed that method was used in America for air-conditioning.

MR. LAWRIE replied that the committees had not started any work on ionization as yet. The reference led him to refer to paint spraying. In the ordinary exhausted booth in which articles were sprayed, half the paint seemed to go on to the booth itself. But he had noticed in a recent article that some American firms claimed to have succeeded in charging the paint particles so that, as they came out of the spray nozzle, they were attracted to the object to be painted, so that there was no loss of paint. If, in like manner, dust particles could be made to seek the ducting instead of diffusing into the atmosphere, a considerable advance would have been made.

The BRANCH-PRESIDENT said the claim was perfectly justified; he had seen the plant, not only in America, but also in this country. It was very efficient indeed, and he was going to suggest to Mr. Lawrie that the principle might be applied to dust control.

Dust Problems in Foundries

MR. LAWRIE said the committees were already making inquiries on the matter and they proposed, as soon as they had obtained all the information available, to start working on the possible application of the method to dust control.

Degree of Danger from Dust

MR. A. A. MATTHEWS said that if we accepted the evidence given in a case before the High Court last year, silicosis was unknown in non-ferrous foundries, but there was still dust in those foundries. Would Mr. Lawrie agree that there was no danger there due to dust which could not be disposed of by having a drink—in the same way that painters were encouraged to drink copious quantities of milk?

MR. LAWRIE did not agree, unless the drink passed through the lungs instead of the stomach—and this was not usual! However, the work he was discussing had not touched the non-ferrous side, so that he could not help very much in that respect. He must, however, emphasize that dangerously-active dust in the lung did not respond to drinking, and he proposed to say this categorically, even though he was not a doctor.

MR. A. R. WIZARD commented that one had to see a film such as that which Mr. Lawrie had shown in order to realize the conditions which the workmen in the foundry had to face and the necessity to try to do something about it. At the same time, when one saw the dust extractors, etc., which surrounded the articles on which the men were working, one began to wonder as to the handicap this equipment caused to the operations to be performed.

Referring to the film, he asked what lighting was used to produce the remarkable photographs of the rising dust clouds. Asking whether Mr. Lawrie had had experience of fettling in the open air, he said that if that were done there would be some complaints in cold weather; but some of the dust problems could possibly be overcome in that manner. He wondered whether a fettling space could be provided in an open field, for example, screens being provided which could be moved around according to the direction of the prevailing wind.

MR. LAWRIE, dealing with the suggestion that, in view of the number of dust extraction appliances placed around the working space, less work would be done, said that perhaps that would be so, particularly whilst the practice was new. On the whole, however, he felt that more work would emanate from the fettlers if it could be guaranteed that the work they were doing would not lead to their contracting any disease.

As to the lighting in which the photographs were taken, he said it was the ordinary Tyndall beam such as was used in the ultra-microscope; by using a strong beam of light in surrounding darkness one could see the dust particles in the air quite well. The lamps were two of 2 kw. each and one 5 kw. Mole-Richardson "Solar Spots." With that lighting it was possible to make some quantitative measure of the amount of dust present by assessing back scatter. By illuminating with polarized light, the scope was enhanced, making possible the measuring of the angle of maximum polarization, which varied with the size range of the particles, and so on. However, it was not desired to be too "scientific," at the present stage of the work.

He knew of one or two open-air fettling shops, and in one of them, the silicosis rate among the fettlers was slightly higher than that among the operators around them, the probable reason being that the erratic air-currents kept the fine dust particles air-borne, and they never would settle out. Furthermore, the weather was sometimes wet and cold, and that was one way of cutting down a fettlers' output!

MR. BRIGG, referring to the electrostatic precipitation of dust, said he believed the main difficulty was to maintain the required velocity of the particles.

MR. LAWRIE agreed, and said that although the velocity of the particles might be high when first projected, it fell off very rapidly. A half-micron particle might be projected at 10,000 ft. per min., but the velocity was soon reduced to about 20 ft. per min.

MR. BRIGG asked whether harmful effects could arise from dusts other than those which caused silicosis.

MR. LAWRIE replied in the affirmative.

Expense of Electrostatic Collection

MR. GRESTY added that the electrostatic precipitation method could be and was used for dust collection in foundries, but he believed the main difficulty was the tremendous expense of the plant. He had seen it in operation in a very large foundry in Switzerland; the building housing the plant, and the plant itself were most expensive, and it was difficult to appreciate how it could possibly be an economic proposition. It might be very good, however, from the health point of view, though he had not been much impressed by the condition of the atmosphere at those foundries.

With regard to open-air fettling shops, he said that Mr. Wigglesworth, the representative of the metal dressers' union on the "Garrett" committee and on the Joint Standing Committee, had spoken very strongly of the utter disgrace of having men working in open-air fettling shops. The committee had agreed with him that the conditions were very unsatisfactory, because they were almost entirely dependent on the weather, and nothing could be controlled because of it. Therefore, it was considered desirable that fettling shops should be proper buildings, *i.e.*, having four walls and a roof.

(To be continued)

ALLIED IRONFOUNDERS' CLUB, angling section held their first meeting of the session last week-end when a party of 27, including visitors from the East Stirling Club and the Laurieston Angling Club, journeyed to Loch Lubnaig, River Ballag, and Loch Voil. Conditions were all against good fishing, but a fair catch was made. A total of 54 fish were caught with a weight of 17 lbs. 9 ozs. Prize-winners were: 1st J. Reid, 4 lbs. 12 ozs.; 2nd P. Buchanan, 3 lbs. 3 ozs.; and 3rd J. Edwards, 2 lbs. 9 ozs.

Conference on Recruitment, Training and Education

C.F.A. Function at Ashorne Hill

(*Continued from page* 354)

Vocational Education

Mr. H. Garratt, now of Tube Investments, Limited, and lately principal of the Chance Technical College, Smethwick, gave the final talk in the morning session, his subject being vocational education. Much nonsense, he said, was talked about education for education's sake, whereas actually most education was in the long run vocational, though this did not detract from one of its major aims which was to fit a man to take his place in the community as a citizen and a member of a cultured community. Vocational education in the present conception was about 100 yrs. old, and began with the formation of the mechanics institutes. Later, surplus money from the successful 1851 Exhibition was spent in organizing the first technical educational bodies, as surviving to-day in the City and Guilds of London Institutes, the Royal Society of Arts, etc. The present set-up for technical colleges was the product of the last 50 yrs., the first part-time day-release colleges being of still more recent origin, as also were the modern universities, which, after all, were really glorified technical colleges.

The threat—" develop our education or go under as a nation "—had been met by a 10-fold expansion in technical colleges in 10 years. The latest proposal was the creation of Colleges of Technology, though the latter were still in the " melting pot." Concluding his remarks, Mr. Garratt made a plea for some sort of craftsmanship certificate or diploma to be available for the student who " never got there " when the technical college examination results were being given out. Lacking perhaps in ability with the written word, these men were nonthe-less valuable products of the college system, with its inculcation of a modicum of discipline and organized thinking, and as such were capable of filling important craft jobs. More co-operation between the technical colleges and industry would help to extend the usefulness of the former.

Considerable discussion followed Mr. Garratt's provocative remarks, the postulated need for " higher " colleges; the alleged handicap to keen students caused by compulsory part-time attendance of all youths and the need for the foundry industry to attract grammar school boys to its ranks, being among the major topics. It was deprecated that, as a college became established, it became progressively more academic and divorced from industrial contact—this was related by Mr. Garratt to the disparity between salaries available to lecturers as compared with their industrial counterparts. The raising of the City and Guilds standards, had, it was felt, left a vacuum for less-highly-qualified youths, for these, the granting of a local certificate of attendance and merit rating was put forward.

University Graduates in Industry

When the conference reassembled after luncheon, the first speaker was Professor R. O. Kapp (consultant, Kennedy & Donkin, until lately, Dean of the Faculty of Engineering, London University, who spoke on the subject of university graduates in industry. First the professor compared the science degree courses with the higher national certificate (H.N.C.) courses and enumerated distinctions and possibilities of improvement and the field of application for recipients of each. The degree was described as:—(*a*) academic—with its stress on theory, (*b*) liberal, and (*c*) time-consuming. In comparison, the H.N.C. course was more practical in its relation to machines, materials and processes. Professor Kapp would like to see this difference accentuated, *i.e.*, the degree more academic and the H.N.C. more practical in their respective bias. In its liberal accommodation of subjects, the technological degree in this country was wider than many " arts " courses, but it was time-consuming—from matriculation, four years full-time study was required to the degree and then two-year apprenticeship in industry was essential. On this latter phase, full marks were accorded to the industrial concerns such as Metropolitan Vickers, who allowed these post-graduate courses. A possible programme which might be adopted was one year's works experience, followed by three at college, then military service and finally a further period in the works. The ratio of industrial graduates to H.N.C. holders was important and 1:5 seemed to fulfil present needs. The Professor was not in favour of the proposed technological university award, simulating degree standard. His main criticism of H.N.C. holders was the narrowness of outlook which was perpetuated in them.

In discussion, there was some agreement among delegates for the Professor's ideas on the value of graduate training, given ideal " material." It was felt, however, that often the best sort of candidate and the one most likely to profit did not reach the university and hence the general usefulness of graduates *per se* to industry was not on the high plane which might be expected.

Company Training Schemes

Newton Chambers.—The programme next took the form of a symposium on company training schemes and their relation to the National Foundry Craft Training Centre. Speakers included Col. N. Dearns (of Newton Chambers), who outlined his firm's scheme in which an annual intake of 20 boys were admitted to the apprentice school in " sandwich " courses of one month's duration over two to three years. All took the same curriculum, of which details were quoted. It was considered

important for the apprentices in the school to melt their own metal for the work and to keep their tasks very closely allied to the jobs going through the shops.

Smith & Wellstood.—The second speaker, Mr. R. F. T. Paterson (Smith & Wellstood) described his Company's scheme as following closely on that recommended in the proposals of the West Midlands' Committee. Mingling of " white-collar " apprentices with others was found beneficial. Use was to be made of a Falkirk day-release scheme for foundry workers, which was due to start in the autumn of this year and financial grants were already in vogue to certificate winners at the technical college, with a merit bonus of up to 10 per cent. on the basic rate awarded to all apprentices on the results expressed by three-monthly reports.

Stanton.—Mr. W. S. Matthews next detailed the Stanton Ironworks' soheme, saying that the initial segregation of apprentices into a hostel had proved valuable. In contradistinction to the previous speaker, Stanton boys underwent a basic training for a two-monthly period annually, instead of a " sandwich " course. Each time, the course fitted the work being done in the particular year of the five-year period of apprenticeship. Throughout their time in the works, boys were segregated with the instructor in the ratio nine to one, and no payment by results was given. A valuable point was that only the methods actually being used in the works were taught to the boys, there was then no chance of " instructor's " methods being preferred to those of the older hands in the shops.

Training Centre.—Mr. R. Forbes Baird then recounted the history and development of the National Foundry Craft Training Centre at Rudge-Littley of West Bromwich, since its inception, then on a regional basis, in 1946. It had been equipped mainly through the generosity of foundry-plant manufacturers, largely as the result of the efforts of Mr. D. H. Wood. A residential club had been inaugurated, with the help of the Joint Iron Council and was a valuable part of the life at the Centre, for here training in " citizenship " was inculcated. Periodical reports of a boy's work were sent to his sponsoring employers and at the close of his terms at the Centre, the boy was presented with a certificate describing his accomplishments.

Speakers in the discussion added information about their own schemes, many of which were similar to those already described. Care must be taken, it was found, to see that apprentices were not used as general labourers. A steelfounder reported that there seemed little relationship in his industry between the existence of a scheme and the success or otherwise of the firm's recruitment, but this was contradicted on behalf of ironfounders present. Local incentive schemes for apprentices came in for approbation from some quarters and criticism from others. One speaker favoured the formation of apprentices' associations within the works, saying that, in his works, apprentices arranged their own works' visits and social events and had their own tool club. The majority of the delegates seemed well satisfied with their own schemes and the response that was being secured, but it was clear that the problems were local, peculiar to the individual conditions and thus difficult to solve on a national basis.

Training for Foremanship

After a break for tea, delegates reassembled to hear three speakers on the subject of training in foremanship. The first of these, Mr. A. B. Lowndes (Leicester College of Technology and Commerce) had spent six years in training supervisors, latterly by means of three-week intensive residential courses. In a very breezy contribution, he said that as the foreman was the key man most concerned with handling men and transmitting ideas, he should be properly trained for the job. Firms should, he said, budget their requirements of supervisors over the next ten years and arrange training accordingly. A clear-cut ladder of promotion was a most worthwhile incentive and internal training was deprecated because it led to " in-breeding " of preconceived notions. In his own schemes, for which the speaker was very enthusiastic, it was claimed that supervisors could be taught their profession outside the industry, quite irrespective of foundry or other background, the discussion-group technique being usually adopted, as opposed to ordinary lectures.

Mr. A. J. Mansell (Institute of Industrial Supervisors) next mentioned the work which his organization could contribute for the betterment of foremen and supervisory grades generally. Taking the foreman as responsible in a major degree for productivity, he quoted at length the various means by which greater awareness of and response to present-day problems could be induced. Practical case-studies in the company of experienced men, as well as group discussions could be suggested, plus information as to the more mechanical applications, such as time-study, work-study, costing and the like. Residential, week-end and period courses, as well as special company-organized schemes, could be arranged by the Institute to suit individual requirements.

Training within Industry

The third and final speaker in this section was Mr. H. Saxon, who put forward for consideration the Government-sponsored " Training within Industry " scheme for supervisory grades. The purpose of the scheme was to clarify the foreman's outlook as to " essentials " and " skills "; these were knowledge of the work, *i.e.*, machines, materials, processes and operations; knowledge of responsibilities; skill in instructing; in leading and in improving methods. The medium usually chosen for elucidation was round-table discussion under a chosen leader, who could be furnished from a " pool " available for the purpose. Supervisors, under the T.W.I. scheme were provided with three programmes, job instruction, job relations and job methods, and each was explained by a " trainer " to eight to ten candidates at a time, in five 2-hr. sessions, usually on consecutive days in working hours and on the firm's premises. These were essentially practical and specific to the works being covered; later on, there were

follow-up and refresher courses. Full arrangements could be made through the local offices of the Ministry of Labour and National Service,* and the service was free; where numbers were small in a given organization, composite groups of supervisors were usually fixed up.

Once again, it was emphasized in discussion of the remarks of the three previous speakers, that selection of the right man for a supervisory job was the all-important precursor to any scheme of training and the ability to make this selection was almost a Divine gift. It was revealed that eight members of the B.C.I.R.A. staff had benefited considerably from a T.W.I. course. Other points mainly concerned applicability of the schemes to small firms, cases of limited scope for promotion, training-time restriction and the need for proper " balance " in the foreman's outlook. In all the answers it was clear that given the right material, progressive educational training would produce good foremen, unfortunately no " specific " was given for perceiving latent qualities of foremanship in the raw recruits.

Discussion Groups

In the late evening of the second day, three discussion groups were held, each with definite terms of reference as follow:—

Group 1: What changes in the pattern of education should the foundry industry try to influence?

Group 2: What value has training as a method of improvement in productive efficiency?

Group 3: Does the ironfoundry industry get the type of recruit it deserves?

With the services of *rapporteurs,* the groups deliberated their respective questions until a late hour, a preponderance of delegates choosing group (2) problems as the most " meaty." Next morning, during the conference sessions, the group chairmen reported the findings to the body of the delegates, although, unfortunately, there was little time available subsequently for general discussion. A summary of these findings would read somewhat on the following lines:—

Group 1: Mr. T. B. McIntyre (lecturer, National Foundry College) as chairman of the first discussion group pronounced its findings as to desirable industrial influence on education as, (*a*) rejection of the idea of reducing the school-leaving age to 14 years; (*b*) more secondary technical schools seemed desirable when building conditions permitted, and their leaning towards foundrywork as one of the basic industries should be encouraged; (*c*) perhaps the National Foundry College ought to specialize in some of their courses according to the branch of foundrywork from which a student was drawn; and (*d*) the College would benefit from further Press publicity.

Group 2: Mr. J. H. Hay, for the second group, said it was generally accepted that training was a major contribution towards raising productive efficiency, but it was only one among many methods and really comprised a " tool " for use by management. Digressing slightly, it had been thought that training should be concentrated on the younger entrants, but responsibility for assessing training needs was placed on the education and training officer (or the person with those duties) within the firm. Promotion was considered the best incentive for training. Ancillary items put forward were the disciplinary effect of training, its value in reducing accidents, in lowering the turnover of labour and its aid towards getting more satisfaction out of a job.

Group 3: Mr. J. Wooding (W. H. Allen Sons & Company, Limited, Bedford) chairman of the third group, reported divergent opinions as to the types of recruits available to foundries and the means taken to develop their capabilities. No data were apparently available for wastage amongst apprentices, most group members seemed to lean to the opinion that securing of apprentices was largely a " cash " problem but that an aggressive attitude in recruitment should be adopted. Other ideas were that foundrywork should be " advertized " (for instance exhibitors of machinery should placard the weight of castings on their products); the industry was not " selling " itself—that " the foundry is a good place in which to work " was not *believed in* by foundrymen; focused propaganda should be issued and equipment for teaching moulding and casting should be acquired by or for schools.

As to the last point, it was later disclosed that the official C.F.A. information from the Ministry of Education was to the effect that headmasters could indent for apparatus for teaching foundrywork, if local demand was sufficient, and classes could then start. In discussion, the possibility of introducing more-elderly trainees to foundries also was mooted and thought feasible in certain localities if tact was exercised. Likewise, specialized classes, it was said, could be organized during vacations at the National Foundry College, if there were sufficient demand from sections of the industry, *e.g.*, on steelfounding, on non-ferrous or any other branch.

Foreign Schemes of Training

In addition to the discussion groups' reports being given on the final morning of the conference, foreign schemes of foundry training were briefly reviewed—American and German by Dr. J. G. Pearce, and French by Mr. J. Bamford.

In the course of his remarks on the American set-up, Dr. Pearce said the foundry industry there was confined to 20 States. Owing to the shortage of graduates taking foundry practice, there had been inaugurated a Foundry Educational Foundation to cater for 300 students per year up to degree standard. Fourteen universities were co-operating in this scheme at a cost for equipment alone of £300,000. No craft work training was taught on a national basis, as it was in this country, but there was a simple merit transition in industry from unskilled to skilled grades according to competence. More importance was attached to inculcating skill in devising simple mechanical means or aids for doing a job on a repetition basis than to hand skills, and it was from men qualified on these lines that executives were chosen. Foundrywork was definitely

* A booklet on the T.W.I. scheme is available free of charge from local offices of the Ministry of Labour and National Service.

regarded as an engineering activity and not as a metallurgical operation; as a result, engineering techniques such as tooling-up for the job, flow-production, use of jigs, gauges, time-production methods, etc., were well to the fore in America.

Germany, on the other hand, possessed organized facilities for training foundrymen at each level. The commissioned-officer class in German engineering industries was catered for by the Aachen Technical High School, which now has 55 professors and 5,000 students. There, the *Geisserei Institut* (foundry section) had its own spacious accommodation and was presided over by Prof. E. Piwowarski, of international foundry repute. The school was severely damaged during the war, but rebuilt premises, comprising a six-storey building, costing £180,000, had just been opened. A further £90,000 had been spent on the re-equipment. The complement of 120 students was made up of about 30 for each year of a four-year course, leading to a fully-trained "foundry engineer." This was generous provision for an industry, but two-thirds the size of the British. Nevertheless, Dr. Pearce considered our system of training, with its emphasis on practical application, at the National Foundry College was certainly not inferior to that of Germany.

French Methods

On the subject of French training methods, Mr. Bamford first gave figures for the size of the French foundry industry, describing it as employing some 100,000 operatives in 2,000 foundries. About 20,000 of the manning were skilled moulders and 4,000 were apprentices. The size of the units was very similar to ours—45 per cent employed from 5 to 10 men and 16 per cent. each with more than 50 men produced about 70 per cent. of the weight output.

Of the three levels at which organized training was carried on—aimed at producing craftsmen, foremen, and managers—the lowest was developed on a three-year apprenticeship basis, with about two-thirds of the personnel indentured. These men took a wide curriculum at the technical schools in the foundry areas, of which there were 18 specializing in foundry-work, both theoretical and practical. Both aspects were treated in national examinations at the end of the apprenticeship. The foremost apprentices in the annual examinations competed for the title of "best apprentice in France." At foremanship level there were two courses open: (*a*) Part-time day classes in Paris, and (*b*) by graduation from the craft schools. Course (*a*) was of three years' duration—on Saturday mornings—plus homework, in addition to doing a normal week's work. Entrance was by examination and, again, the "cover" was very wide. Entrants were often men holding craft certificates. Finally, on the result of craft and theoretical tests, diplomas were awarded.

On the management side, the French have long recognized the need for specialized study in all branches of industry, leading to the establishment of the *ingénieur** class. In 1933, the *Ecole Superieure de Fonderie* was opened in Paris to cater for this class in the foundry industry, initiated by the employers' federation. The school took from high schools about 30 men per annum, holding roughly the equivalent of a degree beforehand and these had eight months practical work and 4 months theory in the year. Some foremen were admitted, all entrance being subject to examination. Final awards of the title *ingenieur* was based on examination on foundry projects and layouts and on oral examinations conducted during the session. Funds were available partly from the employers' federation, but there was a Ministry of Education grant of 5 per cent. and an apprentice tax furnished 20 per cent. Since 1933, some 600 students had passed through this foundry high school—about four times the British turn-out.

In a short general discussion on these foreign training methods, the three-year apprenticeship period was put forward as worthy of emulation in this country and a large measure of agreement for this was secured from the delegates present. Difficulties were said to be with trades unions' attitude and with the paying of full rates before 21 years was reached. It was put forward, also, that the French craft examinations might be imitated, but from the chair, the project was scouted, as many investigations had shown the idea to be unfeasible. Mr. A. A. Roberts, Ministry of National Development (Australia), then stressed the grave problems confronting the foundry industry in his home country, as regards recruitment of lower-grade labour to the foundry. He had visited German establishments and was impressed by the enthusiasm displayed by foundry trainees there. In Australia, the training of the higher executive grades was well looked after by excellent degree and technical-college courses. For the rest, a Government apprenticeship commission has been set up in each state with power compulsorily to arrange four-year indentures, but the intake has been poor and the standard low.

General Pattern of Education

At this stage in the proceedings, Mr. R. W. Blount, H.M. Inspector, Ministry of Education, reviewed this country's educational system, as established by the 1944 Education Act. This provided a general primary schooling for all pupils to 11 years of age. Then, by examination, scholars were routed to (*a*) secondary grammar schools (to 18 years); (*b*) secondary technical schools (to 15 years "plus"); these, in the last two years, were biased towards the industries of the locality. Finally (*c*) 80 per cent. of scholars went to secondary modern schools, which continued the general education up to 15 years. Thus, industry could expect to enrol grammar-school boys at 18 or 16 years, secondary technical school boys at 15½ (with an industrial leaning) and the mass of school-leavers at 16 (eventually) with no special leanings. After leaving school, there were available part-time day and evening technical classes and full-time "sandwich" courses. Afterwards, the speaker enumerated the available proficiency awards open to

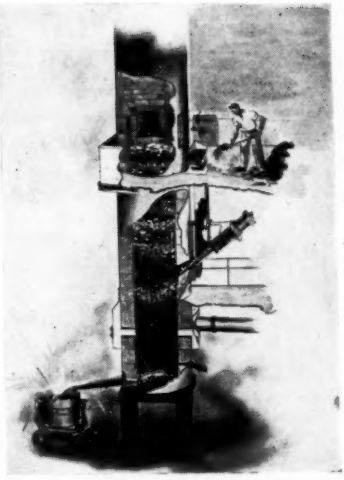
(*Continued on page* 392)

* Not strictly translatable, this term indicates high professional and executive status in the industry covered.—EDITOR.

Swarf Injector for Cupolas

By A. R. Parkes

A further stimulus to the re-awakened interest in the utilization of cast-iron swarf in the ironfoundry cupola (engendered by a leading article printed recently) was provided last week by the announcement by Crofts (Engineers), Limited, of Bradford, that they have perfected a novel process and device for the direct injection of this material into the furnace, with negligible metal loss. Full details of the apparatus and method of working are recorded in what follows.*



An Artist's Impression of the Swarf Injection Apparatus in Operation is shown in the illustration, Fig. 1 (right).

The invention to be described is the outcome of joint work initiated by Mr. Arthur Croft of the Bradford engineering and foundry concern bearing his name, along with his co-director and foundry controller, Mr. Maurice Goff and the chief metallurgist Mr. Douglas Hammond. They have experimented over a considerable period to bring their ideas into fruition, resulting in the production of equipment† for forcibly injecting untreated swarf into the melting zone of the foundry cupola. The device has been working on the firm's own cupolas and is now, after months of trial, offered for sale to other founders.

Operating Principle

The operating principle is both simple and economic as will be apparent from the following account, prepared subsequent to a visit of the writer to view the apparatus under normal working conditions. Briefly, it consists of feeding the borings into the mouth of a chute at cupola-platform level and forcibly assisting their introduction through the refractory wall of the cupola just above the melting zone by means of a pneumatically-operated ram. No admixture of flux or other binder is made simultaneously and no alterations need otherwise be made to the normal method of operating the cupola. The borings should preferably be fairly dry and relatively free from cutting oil and extraneous materials. There is a 1¼-in. mesh grid at the entrance to the chute and this normally rejects oversize material, although care has to be taken not to allow long, thin, bar-shaped pieces (such as files) to be included with the swarf. Flow at the entrance to the chute is assisted by the attachment externally of an electrical vibrator.

A pictorial diagram of the equipment attached to a working cupola is shown in Fig. 1, while other photographs are shown in Figs. 2, 3 and 4. Below the cupola platform, the rectangular-section steel chute is extended to just above the melting zone of the cupola—a distance which is variable according to the size of the cupola and height of the platform above the melting zone. At its lower end is the injector section. This consists of a connector duct, leading from the bottom of the chute and entering the cupola shell at an angle of about 45 deg. and carrying the swarf, till then packed by gravity, through a specially-shaped opening in the refractory so that it fills the interstices between the other constituents of the cupola charge—pig, scrap, coke and limestone—at this level. Since at this point in the shaft the charge constituents are normally at or over 1,000 deg. C. and the atmosphere is reducing, the entering borings assume a similar temperature, agglomerate quickly, and sink rapidly with the rest of the charge to the melting zone, where they melt without significant metallic loss.

Major Difference

Where the newly-developed equipment differs from previous known attempts to add swarf to the cupola melting zone is in the method adopted in the new apparatus of forcing the material amongst the charge by the intermittent strokes of an injector ram, which is incorporated in the entry duct. The injector ram is operated by a compressed-air cylinder from the rear of the entry-duct; this construction can clearly be seen from the illustrations. The ram itself consists of a pointed, 0.4 per cent. carbon steel shaft some 2 in. dia. to which are welded, at staggered intervals over about 12 in. of its lower end, a number of shaped lugs. The ram is mounted centrally in the duct, and by each stroke through the borings the lugs push forward a quantity into the furnace. There are, of course, various protective devices to prevent the ram from entering the hot zone of the furnace when the duct is empty, or from stopping at the bottom of its stroke. Control valves are arranged so as to allow the operator to alter at will the speed of ramming

* "Scope for Co-operative Action," JOURNAL, February 21, 1952.

† World patents for process and apparatus applied for.

FIG. 2.—*Rear View of the Swarf Injector, showing the Compressed-air Cylinder, Valves, etc.*

from zero to a maximum of about 30 strokes per min. At this maximum, nearly 25 cwt. per hour of swarf can be pushed into the melting zone (see Fig. 5). A rate employed on the 36-in. int. dia. cupolas at Crofts is about 20 cwt. per hour for a charge-iron melting rate of four tons per hour which corresponds to a metallic addition of 25 per cent. to the solid charge.

Operating Details

Crofts have two iron foundries at these works; one, a mechanized foundry, produces about 120 tons weekly of castings of a weight range up to 4 to 5 cwt., and the other about 100 tons per week of a larger type. The metal compositions vary basically in phosphorus content, the mechanized section using a 0.3 per cent. P iron and the other a 0.6 to 0.7 per cent. P material; other elements vary to a lesser extent, but both are machinable grey irons. In the firm's machine-shops about 40 tons of cast-iron swarf arise each week, no attempt being made to segregate the compositions. This quantity is now being remelted weekly, mainly on the mechanized plant, as a result of installing the new apparatus on each of the 36-in. i.d. cupolas and operating continuously the swarf injection. Negotiations are in hand to purchase a further 20 to 30 tons of swarf externally so as to further cheapen the average cost of metal at the spout; at the present price of 70s. per ton, these offer a considerable economy over pig-iron or scrap. A typical metallic balance sheet over three months operating the swarf addition is shown in Table I.

TABLE I.—*Iron Foundry Using Croft Process for Melting Cast-iron Borings. (Metal consumption over 3-months' period.)*

Metal used—	Tons	cwt.	qr
Pig-iron	879	16	0
Cast-iron scrap from merchants	22	13	2
Steel scrap	72	16	2
Shop scrap (deficit of stock at end compared with beginning)	60	0	0
Cast-iron borings	378	14	0
Total weight of metal melted	1,414	0	0
Weight of Fettled Castings produced in the Period	1,343	3	0
Metal deficit	70	17	0

The above deficit represents 5 per cent. loss of metal in melting and other foundry operations. This may be allocated as 3 per cent. loss in melting (a quite normal figure even when no borings are used) and 2 per cent. in spillage and fettling losses. It will be noted that the cast-iron borings melted are equal to 26·8 per cent. of the total metal used by the foundry.

Check Campaign

A more detailed check campaign was carried through recently on the same plant in order to establish with considerable accuracy the yield of metal in the ladle with varying rates of addition of swarf.

The furnace is designed to deliver metal to 6 cwt. capacity ladles on a continuous monorail system and is fitted with the syphon-brick method of tapping. The constructional details and charge composition are as shown in Tables II and III.

TABLE II.—*Cupola Details.*

Inside diameter of shell, 54 in.
Diameter at the melting zone, 36 in.
Height of charging door from top of tuyeres, 11 ft.
Ratio of tuyere area: area of melting zone—1 : 6.7 (six tuyeres on one level).
Cross-sectional area of melting zone, 1,018 sq. in.
Metal charge, 7 cwt.
Coke charge, 94 lb.
Flux, 17 lb.
Bed coke height, 3 ft. 3 in. above top of tuyeres.
Air supplied from common blast main from two centrifugal fans at a volume of 2,450 to 2,500 cub. ft. air per min. as measured in inlet.
Pressure in blast main, 21 to 23 in. w.g.

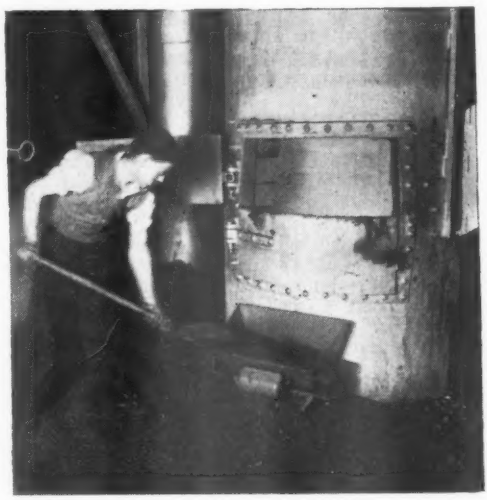


FIG. 3.—*Charging the Chute of the Apparatus on the Cupola Platform. Borings are normally added in Weighed Quantities.*

The requirements are to produce high-duty iron castings, particularly in regard to low-phosphorus content, so as to promote freedom from internal porosity. The metal is inoculated with granular 75 to 80 per cent. ferro-silicon or S.M.Z. alloy if necessary to suit the metal to the casting section.

TABLE III.—*Composition of Charge.*

3 cwt. low-phosphorus or hematite pig-iron.	½ cwt. steel scrap.
	1¼ cwt. cast-iron borings.
3¼ cwt. remelt scrap.	

The amount of cast-iron borings represents 20 per cent. of the total melt.

During the first period of the campaign, when borings were added at the rate of 9 per cent., the solid metal charged was 17 tons 10 cwt. Afterwards, until the end of the blow, borings were added at the rate of 20 per cent. of the metal charge. The loss found on melting was, therefore, the average figure to be expected within the range 9 to 20 per cent. of addition.

The cupola commenced in blast at 7.50 a.m. and the first metal was down into the ladle at 8.5 a.m. and melting continued until 11.30 a.m., when it was stopped until 12.35 a.m. and restarted with the increased rate of borings addition. Full precautions had been taken to ensure that the solid metal charges and the borings were accurately weighed—the solid metal by spring balances calibrated against standard weights and the borings in units of 45 lb. Operating records are given in Tables IV and V.

TABLE IV.—*Metal Charged and Recovered.*

	Tons	cwt.	qr.	lb.
(*a*) Total metal charged :				
104 charges of solid metal at 7 cwt. each	36	8	—	—
290 units of borings at 45 lb. each ..	5	16	2	—
Total	42	4	2	—
(*b*) Metal recovered :	Tons	cwt.	qr.	lb.
Gross weight of ladles and metal ..	68	18	3	6
Tare weight of ladles returning ..	28	2	3	27
Nett weight of metal in ladles	40	15	3	7
Weight of metal in drop		2	2	—
	40	18	1	7
Less slag skimmings from ladles ..		2	1	18
Nett weight of metal produced ..	40	15	3	17
(*c*) Loss in melting :	Tons	cwt.	qr.	lb.
Total charge	42	4	2	—
Metal produced	40	15	3	17
Loss in melting	1	8	2	11

The above loss represents 3.3 per cent. of the metal charged. 32 cwt of slag was produced during the blow, equalling a yield of 85 lb. per ton of metal melted.

TABLE V.—*Chemical Composition of Cast-iron Produced.*

	T.C.	Si.	Mn.	P.	S.
Base iron	3.30	2.20	0.85	0.17	0.11
Inoculated	3.26	2.32	0.81	0.16	0.10
Inoculated S.1 ..	3.35	2.49	0.85	0.17	0.12
Inoculated S.2 ..	3.24	2.68	0.85	0.17	0.11

Other Provisions

It is clear that for very-large-scale operation it would be possible to replace manual charging of the swarf at the cupola platform by a system of hoppers and, likewise, it would be feasible to instal

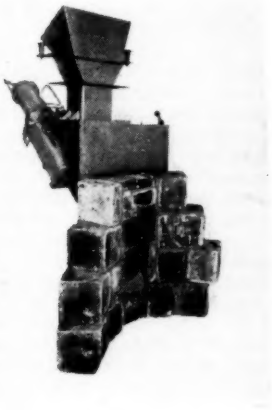


FIG. 4.—*Mock Set-up showing how the Injector is fitted in Relation to the Furnace Stack and Lining; it will be appreciated that in practice the Chute and Hopper are extended upwards to the Charging Platform.*

more than one injector per furnace. It is advised that, during operation, the chute should not be allowed to become empty. Temporary stoppages of the injector for as long as 2 hrs. have been made experimentally, while the furnace was working, without any difficulty in restarting. The life of the ram has not been defined, but it is simple and inexpensive to replace and certainly would last from four to six months. The compressed air required at 80 to 90 lb. line pressure is about ½ cub. ft. free air per ram or, at 20 rams per min., 10 cub. ft. per min; this would feed in swarf at the rate of about 15 cwt. per hr., depending somewhat on the internal resistance of the furnace charge. The shaped firebrick at the entrance to the cupola melting zone is not unduly

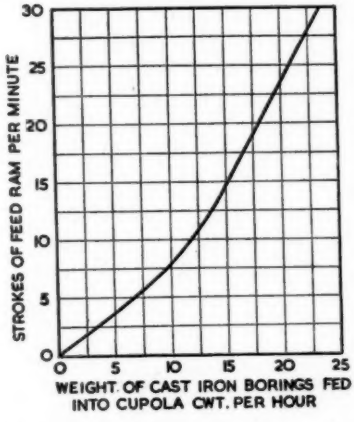


FIG. 5.—*Varying Feed Rate of Borings to the Furnace according to Rate of Operation of the Ram; based on 36-in. i.d., Cupola melting 4½ tons per hr.*

Swarf Injector for Cupolas

eroded in use, as this and the rest of the inlet chute and mechanism to some extent is cooled by the passage of the borings—a life is expected of six to eight months for this brick. No change in the melting rate is discernible, nor in the coke-to-metal ratio for securing "hot" clean iron. In order to consume coke breeze, which is nowadays an unwelcome arrival along with cupola coke supplies, this material can conveniently be charged with the swarf. Crofts now incorporate about 4 per cent. by weight in this way, the normal coke charge being proportionately reduced. Likewise granular ferro-alloys (FeMn or FeSi) can be added along with the borings as desired. Blast pressure requirements seem not to be affected and existing blowing fans are quite suited to the process.

It is claimed that the apparatus can be installed to an existing cupola in 24 hrs. and connected to the shop air-line for immediate use, the total cost being of the order of £400 per injector. The possible economies in use are clearly apparent from the operating details quoted; Crofts themselves are at present obtaining roughly 40 tons per week of *additional metal* previously denied to them and that at a material cost of the order of 70s. per ton (controlled price of borings) compared with pig-iron at £12 to £14 and scrap at £5 to £7. Transport charges, too, are reduced and much material previously wasted can now be fully utilized. Typical of the thoroughness with which this firm view this swarf recovery problem is the fact that nowadays they claim to recover all their borings and turnings—cast iron, steel and non-ferrous—the latter being incorporated in their steel-foundry arc-furnace charges and their non-ferrous foundry material in reverberatory furnaces respectively.

Conference on Recruitment and Training

(*Continued from page* 388)

technical students at the various levels, and touched on possible future trends of education.

The programme having then been completed, it was left to the chairman, Mr. S. H. Russell, ably to sum-up the impacts of the various aspects of training which had been presented at the conference. He singled-out for special mention the value of the film and visual-aid displays and the wide dispersal of subject matter in the Papers presented. Individual experiences recounted by many members had been especially valuable, as were the foreign impressions. It was results like these which counted and for his own part, as leader of one of the productivity teams, he had vivid recollections of the success of the American system of training and the American outlook generally. Finally, Mr. Russell called on the assembly to endorse this thanks to the organizers of the conference (chiefly Mr. J. W. Butler and Mr. D. L. Farrant of the C.F.A.) as well as the lecturers and other speakers and, on this being warmly accorded, the proceedings terminated.

Institute of Vitreous Enamellers

Spring Conference at Southport, May 21 to 23

The 1952 Spring conference of the Institute of Vitreous Enamellers will be held on Thursday and Friday, May 22 and 23, with headquarters at the Prince of Wales Hotel, Southport, Lancs, with Council meetings and a conversazione on the previous evening. The programme is given below and intending participants are requested to complete a reply form for return to the secretaries, John Gardom & Company, Ripley, near Derby, not later than April 30. The programme includes both works visits and technical sessions, the latter on the theme of "process control." The technical sessions also will be held at the works visited. Social functions have been arranged for the evenings with an informal dinner/dance on the Friday. It is hoped members will endeavour to bring their ladies to these functions. A theatre visit has been arranged for the Thursday evening. Hotel accommodation should be reserved individually as soon as possible. In the event of any difficulty in this connection, the secretaries will provide a list of hotels near to the Prince of Wales Hotel, but are unable to make reservations on behalf of members.

Programme

Thursday, May 22.

9.30 a.m.: Depart from the Prince of Wales Hotel, Southport, for works visit to Richmonds Gas Stove Company, Limited, Palatine Works, Warrington (members only).

11 a.m.: Technical paper (at the works), "Process Control of Vitreous Enamelling," by Mr. H. W. Clewes.

12.30 p.m.: Luncheon by courtesy of the Company.

2 p.m.: Depart from the Palatine Works.

2.15 p.m.: Arrive at the Grappenhall Works of the same company, followed by a tour of this section.

5 p.m.: Depart from the Grappenhall Works for Southport.

6.30 p.m.: Dinner (members and guests) in the ballroom of the Prince of Wales Hotel, Southport.

8.20 p.m.: Visit to the theatre.

6.30 to 11.30 p.m.: The ballroom will be available for the use of members and guests not attending the theatre visit and also for members on their return from the visit.

Friday, May 23.

9.30 a.m.: Depart from the Prince of Wales Hotel, Southport, for Stoves, Limited, Rainhill (members only).

10.45 a.m.: Arrival at the works and tour of inspection.

12.30 p.m.: Luncheon by courtesy of the Company.

2 p.m.: Technical paper, "Process Control of Cast Iron for Vitreous Enamelling," by J. Bernstein (official contribution from the Institute of British Foundrymen), followed by "Some Aspects of the Manufacture of Steel Sheet for Vitreous Enamelling," by Dr. E. Marks (official contribution from the Sheet and Strip Metal Users' Technical Association).

5 p.m.: Depart from Stoves, Limited, for Southport.

7.30 for 8 p.m.: Dinner/dance (members and guests) in the ballroom of the Prince of Wales Hotel (informal dress).

IT IS ANNOUNCED that Loughborough Engineering College, Leicestershire, will become a State Technical College from September 1.

THE OPERA COMPANY of Ley's Malleable Castings Company, Limited, produced "The Vagabond King" in the works canteen, Colombo Street, Derby, recently.

Spheroidal-graphite Iron Up to Date

*Discussion of Mr. W. W. Braidwood's Paper**

In the discussion which followed Mr. Braidwood's Paper on spheroidal-graphite cast iron, MR. JOHN LONGDEN said he was happy to corroborate what had been said with regard to the ironer bed shown in Fig. 11. This had machined readily and was steel-like in appearance, with a high finish. The bed was steam-heated in use. The inner and outer walls were connected by webs and the junctions of these with the walls were potential sources of trouble due to porosity. This bed, however, which was required to operate at 120 lb. per sq. in. steam pressure, was perfectly sound and he had been particularly impressed by the density and close grain of the metal.

MR. R. D. LAWRIE asked for more information on the methods of melting employed and the charges used.

In his reply, MR. BRAIDWOOD said that cupolas mostly were used by producers of S.G. iron. So far, these were almost entirely of the normal, acid-lined type in the U.K. and elsewhere in Europe, but, in America, considerable progress was now being made in the application of the basic-lined cupola. This type of furnace had many advantages for the purpose and he expected its use to increase very much during the next few years both in this country and elsewhere.

The charges employed in the acid cupola normally comprised:—

Selected pig-iron, 50 per cent.; returned S.G. iron scrap, 30 to 40 per cent.; and mild-steel scrap, the balance. In the basic cupola, however, the proportion of steel scrap could be 50 per cent. or even higher, with excellent results. He stressed that availability of fully-suitable pig-iron was particularly restricted in Britain, where use was at present being made mainly of refined irons. However, much research to develop methods of perfecting response to treatment was now bearing fruit and, as a result, the raw-material availability position would shortly be much eased.

MR. A. I. DONALDSON said that the matter of a suitable name for the product was one of great importance, especially in dealings with engineers and buyers. He recalled that the term "Nodulite" had earlier been suggested and said he felt that this might have been more suitable, though possibly less accurate than "S.G. iron." He was glad to note the Author's remarks on the progress being made towards lessened dependence on nickel-base alloys for magnesium treatment.

He reported that, in production of S.G. iron castings, his company was making use of exothermic riser-sleeves with good results. Like the Author, Mr. Donaldson thought that the economic attraction of low-sulphur iron produced from high-steel charges would stimulate the development of the basic cupola, but the present restricted availability of steel scrap would be a handicap. Application of heated blast involved high initial outlay and maintenance was an additional item of running cost. In the circumstances, he doubted if the expenditure could be completely recovered by the benefits derived. Nevertheless, if coke quality continued to deteriorate, additional advantage would accrue from use of hot blast. He added that mention had been made of large-diameter rolls cast in S.G. iron and asked what difference the slow cooling of massive sections had on properties developed. Finally, he asked the lecturer to describe in more detail ideal layouts for the production of S.G. iron, provision of which he visualized as a future and advantageous development.

MR. BRAIDWOOD said that he fully realized the psychological and propaganda advantages of a striking name for the product but he had a possibly old-fashioned preference for technical accuracy in terminology. He felt that the name proposed, "S.G. iron," being short and accurately descriptive, had many advantages, but if a more suitable and acceptable name were devised, still technically appropriate, it would be supported. He did not feel that he should add to what he had already said on the subject of methods for introduction of magnesium. He would re-emphasize, however, that the project was on much too great a scale for entire dependence on nickel-base magnesium alloys. Improved and cheaper procedures were being developed, which might render obsolete the use of temper alloys and safe and efficient procedures using metallic magnesium were likely to be evolved.

Exothermic Sleeves

He welcomed the information given by Mr. Donaldson as to the successful use of exothermic compounds in the founding of castings in S.G. iron. He had been privileged to study the methods used by Argus Foundry in production of pressure castings of exacting type, such as valve bodies, covers, etc., in S.G. iron and the excellent results achieved were ample testimony to the soundness of the procedures. The availability of steel scrap varied with locality and also from foundry to foundry. For example, foundries associated with steel fabricating shops were rarely short of steel scrap and greater use of steel in such instances for production of iron castings would make more pig-iron available elsewhere. In any case, conversion to basic cupolas would develop steadily and not overnight and improvement in steel-scrap supplies, over the next few years was probable.

Hot-blast systems would, of course, show greatest savings when fitted to cupolas of large capacity, operated over long periods. British iron foundries had earlier been exceedingly well placed with regard to coke quality, price and availability, and for that reason there had been much less interest in heated blast here than in other countries, less

* Paper presented to the Scottish branch of the Institute of British Foundrymen, Mr. R. R. Taylor presiding, published in the JOURNAL, March 27 and April 3, 1952.

happily placed. The situation, however, had now deteriorated markedly and would probably become worse, so that the advantages of heated blast would correspondingly become more evident. He confidently expected to see many hot-blast systems installed and operating in this country during the next few years.

Mass-effect in the case of S.G. iron was distinctly less than in flake-graphite irons. As evidence of this, he quoted the properties of tensile test-pieces machined from the boss of a five-ton flywheel. These were:—Tensile strength, 35 tons per sq. in.; yield strength, 27.5 tons per sq. in.; and elongation, 15 per cent. in the as-cast condition.

Production Layouts

He welcomed the opportunity to say more on the subject of ideal production layouts, first emphasizing that in the present, still early, stage of this development, production of S.G. iron castings was being carried on mainly in foundries laid out for manufacture of grey iron. In many instances, production of S.G. iron involved changes in furnace charges, in skimming procedure, in gating and feeding methods, in arrangements for fettling, etc., while annealing or other forms of heat-treatment could be applied only at considerable inconvenience. An ideal layout would provide a special melting unit for the purpose, such as a basic-lined cupola, preferably with a water-cooled lining and heated blast and automatic weighing of the quantities of molten iron treated. There would be ample ventilation provided for exhausting magnesia fume to the atmosphere and, indeed, the treatment might well be conducted within a chamber specially designed for the purpose. Use would be made only of teapot ladles for pouring and, in the fettling shop, equipment would be available for ready removal of gates and feeders by high-speed abrasive disc, mechanical saw and/or oxy-acetylene flame. Suitable heat-treatment furnaces would be positioned exactly where required.

MR. W. MONTGOMERY asked for information on the precise reason or reasons for the preference for low-manganese contents in the irons treated. He also enquired if special fluxing techniques were necessary in operation of the basic cupola.

MR. BRAIDWOOD made the point that in magnesium-treated iron, sulphur was almost completely removed. For that reason, none of the manganese present was combined as manganese sulphide and therefore all of it exerted its true alloying effect on the iron and acted to stabilize the pearlite. Therefore, in S.G. iron which was required to be ductile as-cast or after short-term heat-treatment (and that represented the bulk of present-day production), it was necessary to keep manganese low, certainly not above 0.6 per cent., preferably below 0.5 per cent. and more preferably below 0.30 per cent. On the other hand, in S.G. irons required to show the highest strength and wear-resistance, manganese could be kept high, to give fully-pearlitic structures even in slowly-cooled castings.

Basic slags were viscous. Reasonable fluidity was necessary for ready flow of the slag from the furnace and, moreover, ample fluidity was essential if the slag was to be efficient as a desulphurizing medium. To achieve satisfactory fluidity, thinning agents of a suitable type, such as fluorspar and fused sodium carbonate, were normally added with the limestone. Heated blast was also a decided aid in promoting slag fluidity in the basic cupola. Moreover, it was essential to maintain a deep layer of slag within the furnace and to keep its FeO content as low as possible, in order to obtain the very low sulphur content desired in the iron as tapped.

Alloy Deficiency and Annealing Atmospheres

MR. QUINN said that the tendency evidently was to use high-carbon iron as the base material for treatment with magnesium. He asked what would happen if the magnesium addition failed to achieve its purpose? Surely the product would then be a very low-strength iron? Mr. Braidwood had advised the maintenance of reducing atmospheres during annealing. Did he not think that, under such conditions, the presence of sulphur in the furnace atmosphere would encourage formation of pearlite in the surface layers and also cause "peeling."

In reply, MR. BRAIDWOOD said he imagined that few operators of steel-making converters were troubled by the thought that if their process did not work they would be left with a very low-strength material. Production of S.G. iron was analogous in that the properties of the initial material were so much improved by treatment as to put the product into a completely different category. The aim in processing was, by careful control of all phases of the technique, and with the aid of simple, rapid empirical tests, to ensure that the treatment did function satisfactorily.

In reply to the second point, he said that the relevant passage in the Paper had probably been poorly phrased. Instead of stating that the furnace conditions should be "... as reducing as possible," he might more properly have said that oxidizing conditions should be avoided. However, in the single instance in his experience in which a pearlite rim had been found to form in the annealed castings the conditions were known to be strongly oxidizing. In no instance whatever had he had any report of "peeling."

On the call of Mr. R. R. Taylor, a vote of thanks was proposed by Mr. R. O. Patterson, works superintendent, Babcock & Wilcox, Limited, and past-president of the Scottish branch. Mr. Patterson said that all who knew Mr. Braidwood had looked forward to an instructive and enjoyable lecture, and their expectations had been fully realized. The vote of thanks was carried by acclamation.

FOUNDRY APPRENTICES at Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, have been transferred to their new centre, where they will have all practical facilities to learn their craft under the best possible conditions.

Steel Supply and Raw Material Position

Last week were printed extracts from Mr. R. M. Shone's address on "Steel and the National Economy" which stressed production figures and the importance of coke supplies. Below, the subject is continued in extracts from the Iron and Steel Federation's Report for 1951 dealing with the present position of orders for steel, future of ore requirements, and the position for home ores. It is against this background knowledge that foundrymen will need to assess the impact of shortages on their own businesses.

Volume of Orders

At the end of 1950, pressure on the steel industry, which had started to develop at the outbreak of the Korean war, was still rising. By the beginning of March, 1951, outstanding orders, for both home and export, had increased to 8,340,000 tons, compared with 7,420,000 tons at the end of 1950. By the end of 1951, the total had risen still further to 9,520,000 tons.

As far back as October, 1950, it had been obvious to the industry that difficulties would develop in the home market if exports were maintained at the higher level which had been reached after the fall in home demand earlier in 1950. Steps were therefore taken voluntarily to divert more steel to the home market. The consequent complaints received from overseas, mainly through Government channels, led the Federation early in 1951 to ask for an official decision on the division of supplies between the home and export markets. This decision, announced in April by the Chancellor of the Exchequer, was that exports, although reduced from the 1950 level, would have to continue at a volume which was bound to leave the home market short of its full requirements. Export licensing was introduced in April for certain alloy steels and extended to all other steel a month later.

The Federation pressed strongly for Government guidance as to where the home shortage should fall. The Government eventually announced on June 20 that full home distribution control would be reintroduced and that, meanwhile, the steel industry was to give preferential treatment in supply to items designated by the symbols "D.O." within the rearmament field and "P.T." for selected civilian requirements. Control of the distribution of carbon steel was later fixed to start on December 3.

The "D.O." and "P.T." systems, says the report, never operated really satisfactorily. It was designed for short-term conditions, but its term had to be extended because of the subsequent deferment of the reintroduction of distribution control to February 4, 1952.

The independent re-rollers were particularly affected by the exceptional conditions ruling throughout the year, since home supplies were restricted by raw material shortages at some of the steelworks principally concerned. Steps were taken about the middle of the year to increase the supply of billets to re-rollers, but in the circumstances these were only partially successful. One particular difficulty was that extra supplies of billets were also needed by the drop-forgers, who during the year were faced with exceptionally heavy rearmament orders and no lessening of demand from other customers who relied on them for key components.

The shortage of billets was also reflected at other points at the finishing end of the industry, especially in supplies of wire rods for the wire drawers.

When, on August 17, the Minister of Supply announced that carbon steel would be subject to control from December 3, 1951, it was understood that control would be extended to alloy steel a few weeks later. The new scheme was to operate broadly on the same lines as that in force up to May, 1950, with steel allocated by a central inter-departmental committee to the various Government departments and thence authorized to individual consumers.

The Federation had represented strongly to the Ministry of Supply that control of all classes of steel should be reintroduced simultaneously, and that statistical changes should be kept to a minimum. The Federation felt that a simpler form of control, based on broad allocations to direct users only and making use of existing statistics, should be adopted—a proposal which had been put forward several times since the end of the war. In the event, however, the Government decided to revert to the old system.

Long-term Ore Supplies

The industry has continued to do everything possible to ensure future ore supplies, in the face of growing competition from other steel producing countries throughout the world. This involves both the expansion of supplies from existing sources and the development of newly-worked fields.

B.I.S.C. (Ore), Limited, is participating, together with French and Canadian interests, in the exploration and survey of large deposits of iron ore in Mauretania, on the edge of the Sahara Desert. Enough information should be available by the end of 1952 to determine whether or not development is a practicable proposition. The long-term agreement with the Dominion Coal & Iron Company of Canada, concluded at the end of 1950, provided for an increase in the exportable surplus from Wabana for 1952 and several years ahead.

The joint development scheme with the French in Conakry (West Africa) is making good progress, and it is hoped that deliveries will begin towards the end of 1952. There is room for considerable expansion, if necessary, above the initial scale of operations.

The company now working iron ore at Marampa (Sierra Leone) is actively investigating the possibility of developing deposits further inland. It will, however, take some years to bring in further production, since a railway extension of about 80 miles will have to be built and the handling capacity of the port increased.

In Labrador the United Kingdom is likely to obtain, by about 1955, some share of the eventual output of the new orefield being opened up by Canadian and American interests, while in Norway, Sweden, Algeria, French Morocco, and other traditional sources, steps being taken to increase output include the offer of finance and the easy acquisition of mining machinery from this country.

Discussions have taken place in the U.S.A. in an effort to ease current American pressure on European sources of ore supply. As a result, it is hoped that the United States will in 1952 reduce its demand on these sources by 750,000 tons. In 1951 this demand was just over 3,000,000 tons, compared with about 1,000,000 tons in 1946-47 and about 500,000 tons before the last war. Additional ore from the American-controlled mine in Liberia has already been made available.

The industry has been represented on a Government committee set up to review the iron-ore position. This

Steel Supply and Raw Material Position

committee has done valuable work in focusing attention on the importance of adequate supplies of coke, as well as of iron ore and shipping, for the maintenance of pig-iron production at the highest possible level.

Home Ironstone Output

In addition to feeding the expansion of blast-furnace capacity, a considerable increase in home ironstone production took place during the year to supplement imported ore supplies. This resulted in consumption during the year being 1,223,000 tons higher than in 1950. To meet the demands of further new capacity, a programme of 16,000,000 tons for 1952 has been agreed with the ore producers. The industry is helping the ore producers to find the extra labour required.

A full examination has been made of the development of pig-iron and coke-oven capacity up to the end of 1952. The coke-oven capacity available should be in line with requirements but supplies must depend on deliveries from the National Coal Board and independent ovens being kept up to the expected figure and on the availability of adequate coking coal, as the N.C.B. has promised, when new coke-oven capacity at iron and steel works comes into operation.

The development plan formulated by the Federation in 1945 provided for annual steel production to be raised from about 13,000,000 to 15,500,000 tons by 1950-52. By 1948 it had become clear that the steel and steel-using industries would be called upon to carry an even larger share of the burden of the export drive than had been expected, and the capacity target was therefore raised to 18,000,000 tons for a production of 17/18,000,000 tons. It is hoped that this new target will be reached by 1954. More than three-quarters of the work involved in the plan is now either completed or under construction.

Babcock & Wilcox Director's New Post

New responsibilities have come the way of Mr. C. K. F. Hague, deputy chairman and managing director of Babcock & Wilcox, Limited. The Minister of Supply, Mr. Duncan Sandys, announced in a written answer in the House of Commons last week that he had called upon Mr. Hague to be deputy chairman of the Royal Ordnance Factories Board, which has been established with the responsibility of advising the Minister on matters of policy in relation to Royal Ordnance factories. Lieut.-Gen. Sir Kenneth N. Crawford, the Ministry of Supply's Controller of Supplies (Munitions) is to be chairman of the new Board. Mr. Hague is resigning from the Minister's Engineering Advisory Council on taking up his new appointment.

Mr. Hague became deputy chairman of Babcock & Wilcox, Limited, in January, 1950, when Sir Archibald McKinstry resigned from the position at his own request, and it was in similar circumstances that Mr. Hague succeeded Sir Archibald as managing director on December 31, 1944. Elected a vice-president of the British Engineers' Association in January, 1947, Mr. Hague became the Association's president 12 months later. In August, 1947, he was appointed a member of the Council of Industrial Design.

In March, 1944, he was appointed member for Great Britain on the Public Utilities Committee, which dealt with the problem of re-establishing electric, gas, and water services in liberated and conquered countries, his duties being carried out from Washington. For some time Mr. Hague was director in charge of sales for Babcock & Wilcox and he continued to act in that capacity when he was appointed deputy managing director of the Company in 1942.

Rhodesian Metal Resources

No subject is more in the news just now than material resources, particularly in the metal and fuel fields. Despite continual examination and report on world possibilities, so far little has been said about Central Africa. The facts are interesting.

If there is to be industrial development, abundant fuel supplies are necessary, and in this connection Southern Rhodesia is specially rich. Iron ore occurs in immense tonnages in both Northern Rhodesia and Southern Rhodesia. One authority goes so far as to say that the reserves of iron ore are probably greater than those left in the whole of Europe, including Scandinavia. The official report of the Southern Rhodesian Government's consultants showed that in 1949 pig-iron could be produced at Que Que at a manufacturing cost of £3 2s. per ton and steel ingots at £5 17s. per ton. These figures were based on an output of 135,000 tons of ingots per annum, but if this were increased costs would naturally be lowered. With present-day costs of coking coal and with iron ore which compares favourably in analysis with British imported ores at less than 10s. per ton, along with abundant cheap limestone, it is claimed that Southern Rhodesia could to-day produce the cheapest pig-iron and steel in the world.

Other Minerals

Other minerals are also plentiful, among them being copper, gold, platinum, tin, and beryllium. Hydro-electric possibilities are great. The official report of the Inter-Territorial Commission recommended that the waters of the Zambesi should be impounded at Kariba Gorge, the work to be undertaken in two stages. In the first stage, 385,000 kw. would be available and the capital cost of the scheme would be £43,500,000; in the second stage, an additional expenditure of £31,000,000 would give a total of 1,078,000 kw. The price of power at consuming centres in Northern and Southern Rhodesia would be approximately 0.25d. in the first stage and 0.17d. in the final stage. Provided the capital were made available, the first could be in operation by 1961 and the second by 1971. At present shorter-term projects are being investigated.

Industrialization has been steadily proceeding since the end of the war and there is now an integrated iron and steel works in Southern Rhodesia which is operated by a Government constituted commission. The works has a production capacity of 40,000 tons of pig-iron per annum, of which approximately 30,000 tons can be converted into steel, the balance being sold for foundry purposes. The steelmaking plant is being extended to produce 50,000 tons of steel per annum, but this is only roughly one-third of the demand.

Obstacles

Probably the main obstacle to development of all this region has been inadequate communication with the seaboard. A new railway is being constructed from the midlands of Southern Rhodesia to Lourenço Marques. A direct link is also to be provided between Salisbury, in Southern Rhodesia, and Lusaka *via* Sinoia, which will decrease the haul from Northern Rhodesia to the coast by several hundreds of miles. It is also likely that a further link with the South African Railways will be established between the Transvaal and Bulawayo *via* Biet Bridge, shortening considerably the distance between the Rand and Rhodesia.

The main requirements for development of this immensely important region are technical skill, capital, and equipment. Not only do the works require plant of the most modern kind, but improvement of the communication system will require additional locomotives, rolling stock, and ancillary railway equipment.

General Refractories' Records

The demand for all kinds of refractory products continued at a very high level and during the past year the manufacturing resources of the company were fully employed, it is stated by Sir Ronald W. Matthews, chairman of General Refractories, Limited, Sheffield, in his review issued with the accounts for the year ended December 31, 1951. Fresh records were established for turnover, the increases over 1950 being 16.1 per cent. for home sales and 19.3 per cent. for export sales.

Dealing with raw material supplies, Sir Ronald says that while it was true that by far the greater proportion of the raw materials required by the group was obtained from its own mines and quarries, nevertheless the company required to purchase considerable tonnages of imported raw materials for the manufacture of basic bricks and other high-grade products. Besides steadily advancing in price, many of these materials were tending to be in short supply owing to an exceptional world demand and stockpiling for rearmament.

With regard to labour, the chairman says that, although wages had increased and a second week's paid holiday had been granted, the company was still finding it difficult to recruit additional labour to meet all its requirements. So far this deficiency had been overcome by further mechanization of processes wherever possible, particularly in the field of internal transport where considerable economies had already been made.

Engineering Metrology

In the course of the first Sir Alfred Herbert Paper on "The Development of Engineering Metrology," read by F. H. ROLT, O.B.E., B.Sc. (Superintendent, Metrology Division, National Physical Laboratory), before the Institution of Production Engineers in London last month. The Author said it was possible to give indications of the present trends of advancement:—(1) The establishment of a definite numerical relationship between the yard and metre lengths; (2) the use of micro-wave interferometry and other optical methods for large-scale measurements in mechanical engineering; (3) the use of harder materials for prolonging the life of gauges; (4) increased use of recording methods of measurements which enable the results of tests to be seen at a glance from a chart, rather than from a study of numerical values obtained from laborious analytical measurements; (5) incorporation of more measuring devices on machine tools to provide better opportunities for work to be produced correctly in the first instance; (6) increased use of automatic methods of gauging with their resulting economy of labour and usage of ordinary gauges; (7) provision of simple comparative instruments for use in workshops for controlling grades of finish during the course of production; (8) the study of the particular grades of surface finish best suited to meet the various functioning requirements of mating components.

American Steel for Tees-side

The first consignment of American steel under the recent agreement concluded in Washington by Mr. Churchill is expected to arrive in the Tees from Baltimore about the middle of the month. A Brocklebank liner is due to load 290 tons of steel sheets and 1,660 tons of ingots, the latter being destined for distribution in the works on Tees-side. It is understood that two further cargoes will be shipped in the near future.

"Nimonic 95"

The latest achievement of the Birmingham research laboratories of the Mond Nickel Company is the development of Nimonic 95. This alloy, which can only now be mentioned for the first time, has been developed from Nimonic 90, already well-proved as the standard material for the moving blades of the best gas turbines available to-day. It is the result of intensive research which has continued for more than twelve years to improve the high-temperature properties of the nickel-chromium alloys without sacrificing forgeability at the expense of high-temperature strength. Improved methods of manufacture and processing have been adopted so that, although this new material is stronger and stiffer than Nimonic 90, it can still be hot-worked and machined. The new material is the same type of alloy as Nimonic 90 but has an increased content of hardening elements. It provides the same strength as Nimonic 90, but this is retained at operating temperatures some 50 deg. C. higher than those at which Nimonic 90 is used. The new alloy is already in production in the works of Henry Wiggin & Company, Limited, and will soon be available in quantity.

European Foundry Mission to America

The largest technical assistance mission which has yet been sponsored by the Organization for European Economic Co-operation, and which represents European foundry interests, will, it is now officially announced, have as its secretary, Mr. John Bolton, technical secretary of the Research and Development Division of the British Steel Founders' Association. During a four weeks' tour of American foundries, the mission, which comprises delegations from the principal West European countries, will visit the International Foundry Congress being held at Atlantic City from May 1 to 7, 1952. Mr. Bolton was at the Paris headquarters of O.E.E.C. for several days during last week and leaves this week for the U.S.A., where the various European contingents forming the mission will join up. Mr. Bolton was at one time on the editorial staff of the JOURNAL and more recently assistant secretary of the Institute of British Foundrymen.

Wolfram Distribution

At the instigation of the Ministry of Materials and to facilitate administrative arrangements for the purchase, supply, and distribution of wolfram, Metal Traders, Limited, Derby & Company, Limited, and H. A. Watson & Company, Limited, have together formed a new company under the name of British Tungsten. At present the three parent concerns handle the Ministry's business, but when British Tungsten is fully operative, it will, in effect, become the Ministry's sole agent.

It is understood, however, that there will be no change so far as purchasers are concerned and that they will continue to deal through the three parent undertakings.

Representatives of firms in Glasgow, Paisley, Ayr, and Dundee decided at Glasgow on March 25 to form a Scottish branch of the National Union of Manufacturers. This organization has a membership of 5,350 individual firms and 75 affiliated trade associations, representing trades and industries all over Britain. Membership is confined to manufacturers, and it represents in particular the medium-size and smaller firm. It has a single rate of subscription which is applicable to all member-firms whatever their size.

Association of Bronze & Brass Founders

Harrogate Productivity Conference, June 23 to 26

The Association of Bronze and Brass Founders jointly with the National Brassfoundry Association have organized a conference on productivity to take place in Harrogate and the final details of this important fixture are now available. The dates are established as June 23 to 26 and the conference opens with an inaugural dinner on June 25 at which the speakers will be Mr. A. R. W. Lowe, C.B.E., D.S.O., M.P., parliamentary private secretary, Ministry of Supply; Mr. Henry M. Laws, productivity technical assistant, U.S.A. Mutual Security Agency, The Hague; Mr. Noel P. Newman, J.P., president, Council of Ironfoundry Associations, and Mr. F. A. Martin, O.B.E., B.Sc., leader of the British steelfounders' productivity team.

Programme Details

The proceedings in general are as previously listed, and promise to be of outstanding interest. With the final programme, however, the names of the speakers are announced so that the amended programme will be:—

Tuesday, June 24: Chairman, Mr. Geo. F. Mundell, president, Association of Bronze and Brass Founders.

9.30 a.m.: "How Increased Productivity can be obtained in British Brass Foundries," by Mr. Frank Hudson, F.I.M. (leader, brassfoundry productivity team).

10.00 a.m.: "Foundry use of Nitrogen Degassing and Mould-reaction in Producing Leaded Gunmetal Castings," by Mr. E. C. Mantle, M.Sc., A.I.M. (British Non-Ferrous Metals Research Association, member, brassfoundry productivity team).

10.30 a.m.: "Efficiency of Feeders for use with Copper-alloy Sand Castings,"' by Mr. R. A. Skinner, B.Sc., and Mr. R. W. Ruddle, M.A., A.I.M. (British Non-Ferrous Metals Research Association).

11.00 a.m.: "Patternmaking Techniques with Special Reference to the use of Aluminium-alloy Match-plates," by Mr. E. C. Mantle, M.Sc., A.I.M., and Mr. D. H. Potts (members, brassfoundry productivity team). Here it is hoped to illustrate this talk with the film "Making a Match-plate with U.S.G. Formulated Metal Casting Plaster" (U.S. Gypsum Co.).

2.00 p.m.: "The Brass Trail" (foundry section).

2.15 p.m.: "A Simple and Cheap Mechanized Layout for the Small Jobbing Brassfounder," by Mr. F. C. Evans (John Miles & Partners).

3.00 p.m.: "Use of Flexible Cutting-off Wheels in the Brass Foundry," by Mr. C. A. J. Timms (member, brassfoundry productivity team).

3.30 p.m.: "Increasing Productivity in the Coreshop by the use of Core-blowing Machines and Synthetic-Resin Corebinders," by Mr. P. G. Pentz (Leicester, Lovell & Company, Limited).

The programme looks a little overcharged, but this may help appropriately to keep everybody down to "brass tacks."

Wednesday

For the next day, Wednesday, June 25, with Mr. W. H. Davies (C. & L. Hill, Limited) in the Chair, papers and speakers will be:—

9.30 a.m.: "Need for Adequate Incentives," by Mr. A. N. Wormleighton (joint secretary, brassfoundry productivity team).

10.00 a.m.: "Labour Relations and Good Housekeeping," by Mr. B. G. Dewsbury (joint secretary, brassfoundry productivity team) and Mr. W. B. Lawrie (H.M. Inspector of Factories, Engineering and Chemical branch), who will present a film, "Observations of Dust in Steelfoundry Dressing Operations."

11.00 a.m.: "Time and Motion Study with particular reference to the Mueller Plan and the Yale & Towne 100 per cent.-allowed-hour Incentive Plan," by Mr. C. D. Hunter (director, Stevenson, Jordan & Harrison).

In the afternoon there are to be two sessions. At Session "A", over which Mr. W. H. Davies, B.Com., will preside, there is to be a "Cost Clinic" after which a panel of adjudicators will report upon the results obtained from circulation of the imaginary job sheet and present a prize for the best entry. This will be followed by a general review of the proceedings and the need for organizing regional meetings to continue the work started at the conference by Mr. Frank Hudson.

At Session "B," where the Chairman will be Major R. C. Watts, M.C., vice-president, National Brassfoundry Association, the following papers will be given:—"Pressing, Forging and related Tools," by Mr. W. F. Underhill (member, brassfoundry productivity team); "General Machining and Taper Turning," by Mr. F. E. Rattlidge (member, brassfoundry productivity team), and "Factory Transport and Storage," by Mr. C. H. Wilson (deputy leader, brassfoundry productivity team).

Thursday

On Thursday morning, with Major R. C. Watts, M.C., again in the Chair, there are to be two papers. "Assembly, Testing and Inspection," by Mr. F. E. Rattlidge, and "Finishing Methods."

A feature of the conference will be showing of over a dozen films. These are to be either interspersed with the technical sessions or to form complete sessions on their own. There will be no exhibit of foundry equipment by the organizers, as was proposed, this having been found to be impracticable.

Reappointed to Steel Corporation

The Minister of Supply has reappointed Mr. A. R. McBain as a part-time member of the Iron and Steel Corporation of Great Britain. It will be recalled that Mr. McBain first took up the appointment in October, 1950, after Mr. R. A. Maclean had withdrawn his initial acceptance of an invitation to become a part-time member of the Corporation. In April of last year it was announced that Mr. McBain had agreed to serve for a further period. Formerly a permanent civil servant, he continued to undertake special duties for the Ministry of Supply after his retirement at the end of 1948. A visit to the United States in 1950 in connection with production for defence was one of these special duties which he performed for the Ministry.

THE U.K. PAPER at the Fourth International Mechanical Engineering Congress, June 4 to 10, in Stockholm, will be "Engineering Properties and Applications of Spheroidal-graphite Cast Iron," by Dr. A. B. Everest, of the Mond Nickel Company, Limited. Further information can be obtained from the British Engineers' Association, 32, Victoria Street, London, S.W.1.

Personal

MR. W. T. WREN has been appointed assistant managing director of Allied Ironfounders Limited.

MR. C. GORDON HUNTLEY, manager of the Manchester office of Davidson & Company, Limited, Belfast, has been elected President of the Manchester Association of Engineers for the session 1952-53.

Presentations were made last week to MR. ALFRED STORY, chief storekeeper in the engineering department of William Doxford & Sons, Limited, engineers and shipbuilders, of Sunderland, upon his retirement after 42 years' service with the company.

MR. RICHARD EDWARD LINTON has been appointed a local director of Kayser, Ellison & Company, Limited, steel manufacturers, of Sheffield. He has been with the Company for nine years, and has been in charge of its London office since 1946.

To mark the completion of 40 years' service at the Sheffield district office of the British Thomson-Houston Company, Limited, MR. C. A. RUSSELL, manager of the office, has been presented with a portable typewriter and a scroll bearing the signatures of the subscribers.

A presentation was made to MR. HERBERT CROSSLEY BUTCHER, secretary of Samuel Fox & Company, Limited, steel manufacturers, of Sheffield, upon his retirement after 52 years' service with the company. He had been secretary of the Company for 23 years.

A former worker in the technical research and development department of Stewarts and Lloyds, Limited, Bilston, (Staffs) and a former student at Wednesbury Technical College, MR. JOHN MONOGHAN, has been awarded the Riley gold medal of the West of Scotland Iron and Steel Institute. The award was made for a paper he delivered to the Institute last year when he was with Stewarts and Lloyds, in Scotland.

MR. H. TAYLOR of Taylor's Foundry, Limited Alperton, Middlesex, has his roots in Norwich and next week his four sons, Arthur, Jack, Robert and Edwin are to receive the Freedom of that City as a hereditary honour. Mr. Taylor, senior, a member of the Institute of British Foundrymen since 1937, came to London just before the war and has built up a very flourishing iron and non-ferrous business. One of his sons, Mr. A. F. Taylor, is a director (and secretary) of the firm.

MR. W. T. NEILL has been appointed production manager at the Lostock, Lancs, factory of the De Havilland Aircraft Company. At the beginning of the war he was consulting engineer to Scottish Aviation, Limited, Prestwick, and was subsequently their assistant works manager and latterly assistant general manager, leaving in 1949 to join the De Havilland Aircraft Company. Mr. Neill is 36 and was awarded the M.B.E. at the end of the war for his services at Prestwick.

MR. BRUCE S. FLETCHER and MR. CHARLES D. FLETCHER, formerly chairman and works director, respectively, of Fletcher Houston, from which Board both recently resigned, have secured a controlling interest in Henry Robinson and Company (Ironfounders), Limited, at Stourbridge, which has been established well over a century. The other directors are Mr. G. C. Roberts, Mr. S. A. B. Roberts, and Mr. R. T. Hall. The firm which has specialized in castings for the building and hardware trade is also to manufacture precision castings.

American Library : Industrial Section

The American Library, at 41, Grosvenor Square, W.1, has recently opened an industrial section, which includes American books, periodicals, government documents, and other literature in the fields of technology, engineering, management, trade and agriculture. Books and other material can be borrowed by anyone in Great Britain, and, where necessary, will be sent by post. In cases where a book or periodical is not available for loan, photostatic copies of special articles will be provided free of charge. The library also answers requests for information received by telephone or letter.

The library works in close co-operation with British technical libraries and specialized research agencies, and acts as liaison with appropriate agencies in the United States where information in its own collection is not sufficient. It has full access to existing special American indices which give complete reference by subject of all articles or books published throughout the English-speaking world. The library is open to the public, Monday to Friday, from 9 a.m. to 6 p.m. All service is free and enquiries are welcomed. Communications should be addressed to: Industry Section, American Library, 41, Grosvenor Square, London, W.1. Enquiries will be answered by calling GROsvenor 9000, extension 447 or 748.

I. BIER & SON (IRON & STEEL), LIMITED, of Bevois House, 27-30, Basinghall Street, London, E.C.2, inform us that they have been appointed the sole agents and distributors for the charcoal pig-iron manufactured by Eisenwerk Sulzau-Werfen, of Vienna and Salzburg, Austria.

INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED, have just completed a 7¼-mile pipeline through which the bulk concentrate from 3,650,000 tons of nickel-copper ore is being pumped annually from the newly-built Creighton concentrator to the reduction plants at Copper Cliff. It is believed that never before has concentrate been carried by pipeline in such quantity over such a distance.

Obituary

A director of Engineering Components, Limited, Slough (Bucks), DR. PATRICK GILL GRIFFITH died recently at the age of 88.

A director of Sanderson Bros. & Newbould, Limited, steelmakers, of Sheffield, MR. CHARLES W. CROSSLEY died recently.

MR. HORACE SHANKLAND, a local director of the Dunlop Rubber Company, Limited, until two years ago, has died at the age of 69.

For 45 years a director of Goodwin & Company, Limited, steel manufacturers, of Sheffield, MR. ALFRED TEATHER died recently at the age of 76.

MR. JOHN EDWARD MARKLAND, secretary and a director of Pickford, Holland & Company, Limited, ganister manufacturers, etc., of Sheffield, died recently.

MR. HARRY PERCY BAXTER, a works manager of Edgar Allen & Company, Limited, steel manufacturers, of Sheffield, has died at the age of 74.

A well-known figure in the Sheffield steel trade for many years, MR. E. G. DIGNAM, died recently aged 78. He joined Thos. Firth & Sons in 1896 as assistant to the Company's foreign correspondent, and later became, for some years, its representative in Genoa, Italy.

News in Brief

AN ORDER from Finnish owners for a cargo liner of 8,500 tons dw. has been received by William Gray & Company, Limited, West Hartlepool.

HARLAND & WOLFF, LIMITED, Glasgow, have received an order for a cargo motorship of about 7,000 tons for the British Phosphate Commissioners, Melbourne.

AT THE ANNUAL MEETING of the International Combustion (Holdings), Limited, Mr. G. R. Taylor, in his review of the year's activities ended September 30, 1951, reported record profits and orders for the year.

MORE THAN 50 PER CENT. of the scrap metal coming into Britain was for Scotland and, as a result, unemployment was being arrested, said Mr. John Lang at the Scottish Labour Party conference at Largs last weekend.

NEARLY 2,000 IRONSTONE MINERS in the Cleveland area of Yorkshire are to receive a wage increase retrospective to January 21. The increase will be 1s. a shift for datal men, and proportionate advances for piece-workers.

TWO HUNDRED AND FIFTY gold wristlet watches were presented last week by Mr. T. Brown, joint managing director of the Sheepbridge Company, Limited, iron and steel manufacturers, of Chesterfield, to long-service employees of the company.

THE TWO LARGEST PRODUCERS of aluminium castings in America—the Aluminum Company of America and the Bohn Aluminum and Brass Corporation—have been licensed to use the Al-Fin process for the molecular bonding of aluminium to iron or steel.

THE PRICE of tungsten ore of standard 65 per cent. grade and ordinary quality was reduced with effect from Monday from 535s. to 500s. per long ton unit delivered consumers' works. Announcing the reduction, the Ministry of Materials stated that the new price was related to the current price of imported supplies.

WEARSIDE SHIPYARD TRADE UNIONS have been asked by the Wear Confederation of Shipbuilding and Engineering Unions to give their views on the question of an all-the-year-round five-day week in the shipyards. At present the yards work a five-day week, eight months of the year, and 5½ days during four winter months.

A 500-TON PASSENGER-CARRYING MOTORSHIP is to be built by Ailsa Shipbuilding Company, Limited, Troon (Ayr), for Watts, Watts & Company, Limited, London. Driven by twin screws, the vessel will be employed on the Gibraltar-Tangier service. Propelling machinery will be supplied by British Polar Engines, Limited, Glasgow.

A STATEMENT from J. & R. Fleming, Limited, of 146, Clerkenwell Road, London, E.C.1, announces that they have recently placed on the market Armorglas toughened lenses for industrial goggles. The glass is quite difficult to fracture and when it does the pieces formed are cubes devoid of sharp edges. Usually, it is claimed, the pieces remain adhering to the frame.

AFTER TELLING MR. SLATER that no development councils under the Industrial Organization and Development Act, 1947, had been established during the last year, Mr. H. Strauss said that the President of the Board of Trade was prepared to establish further development councils only where there was substantial agreement on both sides of an industry that such a council was desirable.

PART OF A FACTORY in the northern part of Glasgow, formerly used as a Government armament works, is to be taken over by Metropolitan-Vickers Electrical Company, Limited. The Board of Trade, announcing the development in association with the Ministry of Supply, stated that the factory space would be used for the manufacture of condensers and ancillary plant for use in power stations in this country and abroad.

MANCHESTER & DISTRICT IRONFOUNDERS EMPLOYERS' ASSOCIATION held its Annual Ladies' Evening at the Lymm Hotel, Lymm, Cheshire, last month. Eighty-three members and ladies were present and were received by the president and vice-president and their wives, Mr. and Mrs. J. E. Smethurst and Mr. and Mrs. J. E. Storey. Apart from a few words of welcome by the president there were no speeches, and the guests were entertained by the Ricardo Brothers and Mr. George Wright.

MR. A. S. DAVIS, Regional Controller for the Ministry of Supply in Birmingham, stated on March 27 that over 12,000 armament contracts to the value of millions of pounds have been placed with Midland firms, many of them foundries, since January 1, 1951. He added that the bulk of the contracts are going to the Birmingham, Coventry and Black Country centres of the engineering and foundry trades, and that Mr. Churchill's super production drive will mean even fuller order books in those areas.

BRITISH CELANESE, LIMITED, are organizing an exhibition, "Development in 'Celanese' Plastics," to be held in their offices, Celanese House, Hanover Square, London, W.1, as from April 28. There is to be shown such items of interest as shatterproof machine guards and protective eye wear. These are made from "Celestoid" sheets which vary in thickness from 1/100th of an inch to ¼ in. These sheets can be cut and bent. British Celanese do not supply components made from their material.

THE GREENOCK FIRM of Blake, Barclay & Company, Limited, which has been engaged in the manufacture of sugar-refining machinery for almost a century, has branched out into two further lines. One of the new developments is the manufacture of paper-making machinery, for which orders have already been received to the value of £30,000. The other is the making of a special type of sluice valve essential to merchant ships, particularly oil tankers, which have been ordered by a number of shipyards, both in Scotland and England.

A TIGHTENING of supplies of coke—which last week meant reduced blast in some West of Scotland foundries—has reached the point where castings firms are working on "hand-to-mouth" supplies. "The position is very precarious," said the manager of one Glasgow foundry. The smaller foundries are in almost constant anxiety about their supplies. Not only are supplies coming forward erratically, but the quality has dropped. Most firms used Durham coke exclusively before the war and some burned South Wales coke, but now mostly Scottish coke is being used.

SOME REPRESENTATIVES from local foundries attended a meeting in Birmingham on March 27 at which four members of the Anglo-American Committee on Productivity analysed the findings of their enquiry into the training of factory supervisors. They heard that in America foremen are specifically trained to deal with the "human factor," and that this aspect of their work is continuously emphasized, whereas in Britain the tendency is to appoint good craftsmen as foremen rather than good leaders. Mr. J. H. Williams, of British Railways, said that unless a foreman had a thorough knowledge of human nature he would never be a first class supervisor.

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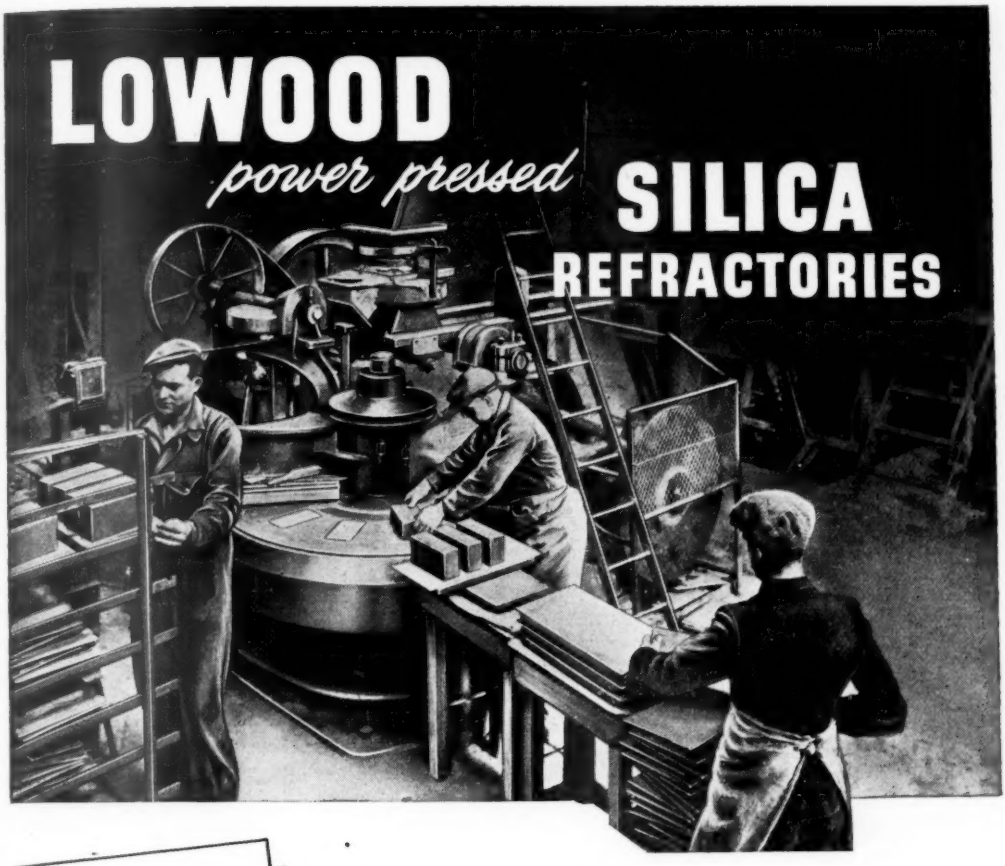

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Raw Material Markets

Iron and Steel

The rising trend of pig-iron production continues, but the aggregate output still falls substantially short of requirements. Coke has become the crucial factor. The blast furnace owners have achieved substantial economies in fuel consumption, but their need for coke is greater than the available supply, and in consequence the flow of basic iron to the open-hearth furnaces has not yet been raised to the requisite level. The shortage of pig-iron afflicts the iron foundries just as much as it does the steel industry, and the licensing authority has no easy problem in achieving an equitable distribution of iron as between the two industries. The stock figures are rather better than they were at the beginning of the year, but it is still necessary to maintain a veto upon all exports of pig-iron.

Independent steel re-rollers continue to encounter grave difficulties arising from the lack of billets. But the outlook is a little brighter. Imports from Western Europe are now coming to hand more freely and shipments of American ingots are expected to assist the British steelmakers in the provision of bigger tonnages of steel semis. The most urgent needs are sheet bars, billets, and wire rods.

The extent of the undelivered tonnages of finished steel products at the end of the first period is not yet known, but the authorities appear to have adopted a policy of extreme caution in the issue of licenses for the current quarter, and hopes are entertained that it may be possible to allocate supplementary tonnages. Much will depend upon the volume of material received from America. It is still insisted that only small tonnages can be expected before the end of June, but a number of ships are already loading at Baltimore, and the first consignment of steel from Japan has already arrived. Thus, progressive improvement in the steel position may be reasonably expected, and, as the export trade is subdued, home consumers should be the chief beneficiaries.

Non-ferrous Metals

On April 1 the Ministry of Materials announced a £4 increase in the price of copper, which accordingly became £231. On the same day aluminium was raised by £6 to £154. Scrap prices have to be adjusted accordingly, but although the change in the light metal was made promptly, some delay occurred in giving effect to an altered schedule for brass and copper. It only remains to add that last week saw cash tin close 15s. higher on the London market with three months £1 10s. lower, the contango coming in to £3, compared with nearly £5 a week earlier.

London Metal Exchange official tin quotations were as follow:—

Cash Thursday, £962 to £962 10s.; Friday, £964 to £964 10s.; Monday, £961 to £962; Tuesday, £960 to £961.

Three Months—Thursday, £965 10s. to £966; Friday, £967 10s. to £968 10s.; Monday, £964 10s. to £965; Tuesday, £962 10s. to £963.

That was the extent of price changes last week, for there was not, as some people expected, any alteration in the Ministry of Materials quotations for lead and zinc. Both these metals look very dear in comparison with prices ruling elsewhere. On the Continental market lead is no better than £150, which compares with £163 here and £152 in the United States. The latest Gulf Port price was reported as round about 18 cents, equal to £144.

In Britain users of zinc must pay £190 for G.O.B. brands, with a premium of £4 for high grade. Abroad the value is about £160. In these circumstances it is not surprising that U.K. consumers are dissatisfied.

February statistics have been published by the British Bureau of Non-ferrous Metal Statistics. Consumption of copper was 50,933 tons, of which 33,178 tons was virgin and 17,755 tons scrap. In January the corresponding figures were 52,809 tons, 31,613 tons, and 21,196 tons. Stocks of copper were reduced from 106,890 tons at January 31 to 103,123 tons at the end of February. Zinc stocks moved upwards, from 44,539 tons to 47,078 tons, while consumption of virgin declined by about 2,000 tons to 16,736 tons.

In lead, stocks again increased, and the total on hand at February 29 was 104,206 tons, a rise of more than 14,000 tons on the January figure. Consumption was 15,858 tons of virgin and 9,238 tons of secondary, so that usage is covered for about seven months on the present stock basis. The U.K. consumption of tin was 1,993 tons, 294 tons lower than the January figure.

On the whole, the figures are not discouraging if one remembers that February was a short month. In the light of the continued copper shortage, the monthly figures of consumption keep up remarkably well.

Foundry Extensions

The following announcements have been made of proposed foundry extensions:—Highway Iron Founders, Limited, are planning extensions to their premises at Phœnix Street, West Bromwich; Hundridge Foundry, Limited, have had plans approved to erect a foundry at Central Street, Hull; the Lumsden Machine Company, Limited, Hawks Road, Gateshead, have plans to extend their foundry, and plans have been prepared by Billington & Newton, Limited, to extend their foundry at Longport, Newcastle, Staffordshire.

Three Falkirk foundries are to carry out extensions. Merchiston Foundry, Limited, are to extend their loading bank and erect a sand shed at their Bainsford works, at a cost of £500. Grangemouth Iron Company, Limited, are to build a garage and new entrance gates at their Grange Iron Works, Camelon, to cost about £625, and James K. Miller, Limited, are to erect a 33-ft. clear span building to replace and enlarge their existing moulding shop at Parkhouse Works at an estimated cost of £3,500.

French Steel Deliveries

Deliveries of steel to the French home market in 1951 were 17 per cent. above the average of deliveries for 1949 and 1950, reflecting the expanding needs of the home market as a result of the rearmament programme. This upward trend became even more pronounced in the last quarter of the year.

The total exports of iron and steel products from France and the Saar were 4,600,000 metric tons in 1951, against 4,000,000 metric tons in 1950. The tonnage taken by the United States was up by 307,000 tons at 758,520 tons.

The level of exports showed a sharp decline, however, after July, 1951, as compared with the earlier months of the year. For some months now exports have been below the rate fixed by the Government. This falling off is causing concern both in Government quarters and to producers, more especially as a fall has also taken place in the number of export orders booked, particularly in orders from dollar areas.